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Assessing the impact of the extension training and visit system on the transfer of wheat technology to farmers in Ankara, Turkey

Vedat Uzunlu
Iowa State University

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Vedat Uzunlu

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CHAPTER 1. INTRODUCTION

Outlook in Turkey

Turkey covers a total of 780,576 square kilometers, of which ninety-seven percent is in the Anatolian Peninsula and three percent is in Europe. The population is around fifty-two million (World Book, 1989), forty-six percent of whom live in rural areas and are engaged in agriculture. The rural population is less than half, a figure which can be compared to Pakistan's seventy percent rural and India's eighty percent (World Book, 1989).

Turkey, being surrounded by seas and covered by rough landscape, has an ecological structure that allows for four seasons simultaneously. It has various climatic regions and an average rainfall that changes from 300 mm (12") to 2400 mm (96") in different regions. Dominant climates are the Mediterranean climate, with hot, dry summers and warm, rainy winters and the Continental climate with low rainfall, partial humidity and a great range of differences between day and night temperatures. This extreme geo-climatic diversity permits a wide range of crops to be grown under both rainfall and irrigation conditions. Some regions are suitable for multiple cropping.

The production of major crops in 1984 is shown in Table 1.1.

With forty-six percent of the population engaged in agriculture, the share of

Table 1.1: Production and yields for major crops in Turkey, 1984 (MAFRA, 1987a)

Crops	Production (Tons)	Yields (Kg./Ha.)
Cereals and Pulses		
Wheat	17,200,000	1,920
Barley	6,500,000	2,006
Corn	1,500,000	2,729
Rice	280,000	4,379
Lentils	570,000	944
Chick Peas	335,000	975
Industrial and Oil Crops		
Sunflower	7,710,000	1,262
Sugarbeets	11,108,000	31,439
Cotton	560,000	848
Tobacco	147,000	932
Tea (Green Leaves)	569,000	–
Fruits		
Hazelnuts	300,000	–
Citrus	1,300,000	–
Grapes	3,300,000	5,280
Olives	800,000	–
Vegetables		
(Total)	14,145,700	–

agriculture in the Gross National Product was 18.7 percent in 1985 by current factor prices. Growth rates of value-added agricultural products showed variations: they averaged 3.5 percent, 2.4 percent, and 7.4 percent respectively for the years of 1984, 1985, and 1986. Total exports from Turkey were 7.96 billion U.S. dollars in 1985 (Demir, 1987). The share of agricultural products in overall exports was 21.6 percent. Major export items were tobacco, cotton, fruits and vegetables, pulses, livestock and livestock products. The principal outlets of agricultural exports were the Middle East (36%), Europe (33%), the U.S. (17%), and Socialist countries (9%) (Demir, 1987).

Turkey has a suitable communication and transportation network for export and import, as well as tourism. The highway and maritime transportation network of Turkey provides good connections with the Middle East, North Africa and Europe, and especially with the U.S.S.R., through the Istanbul and Çanakkale straits.

The coastline of Turkey is 8,333 kilometers (4,800 miles). She has 200 natural lakes and 103 man-made dammed lakes. The country's fish production is approximately 500,000 tons per year (Demir, 1987).

Total arable land is 28.5 million hectares, of which 8.5 million hectares can be economically irrigated; however, only 4.2 million hectares are actually being irrigated. Several irrigation projects are under construction, the biggest one being the Southeastern Anatolia Project, which will provide gradual irrigation of 1.7 million hectares when completed (Demir, 1987).

Since the establishment of the Turkish Republic in 1923, there has been substantial development in the agricultural sector. Total agricultural land has increased from 11.7 to 28.5 million hectares. At the same time, productivity per hectare has gone up eight to ten times depending on the variety of agricultural products. The

Table 1.2: Wheat acreage, production and yields from 1926 to 1990 in Turkey (MAFRA, 1987a)

Year	Acreage (1000 ha.)	Production (1000 ton)	Yield (kg/ha)
1926-30	2,882	2,150	746
1931-35	2,966	2,567	865
1936-40	3,804	4,020	1,057
1941-45	3,950	3,319	840
1946-50	4,206	3,630	863
1951-55	6,013	6,369	1,059
1956-60	7,435	7,910	1,064
1961-65	7,827	8,450	1,080
1966-70	8,292	9,924	1,197
1971-75	8,855	12,290	1,388
1976-80	9,259	16,750	1,809
1981-85	9,166	17,020	1,857
1986-90	9,300	19,000	2,043

use of fertilizers, improved varieties of seed, chemicals, and agricultural machinery has brought about this development. For example, the total production of wheat has increased from 2,000,000 tons in 1920, 3,600,000 tons in 1950, to 9,900,000 tons in 1970, and with a predicted great increase to 19,000,000 in 1990 (Mizrak, 1986).

Turkey is presently very rich in different types of wheat, including winter and spring varieties. Dew, rainfall, and the cold winter/dry, hot summer climate make wheat the unrivalled crop in Turkey. Wheat is the staple food, primarily as bread, cracked wheat, macaroni and biscuits.

The production area of wheat is about 13 million hectares of the 28.5 million total arable area. Yearly wheat growing area is around 9 million hectares, and 4 million hectares lie fallow. (State Institute of Statistics Prime Ministry, Republic of Turkey, 1989).

Table 1.3: Wheat cultivars released in 1970-86 period (Mizrak, 1986, p. 5)

Bread wheat	Durum Wheat
Bezostaya 1	Dicle 74
Bolal 2973	Gediz 75
Gerek 79	Çakmak 79
Tosun 21	Tunca 79
Tosun 22	Gökgöl 79
Etoilede Choisy	Diyarbakir 81
Porsuk 2800	
Cumhuriyet 75	
Sakarya 75	
Orso	
Lancer	
Haymana 79	
Kirkpinar 79	
Ata 81	
Gonen	
Izmir 85	
Atay 85	
Marmara 86	
Çukurova 86	

Wheat Research in Turkey

In 1920, agricultural research activities began with the foundation of the Seed Improvement and Experiment station in Ankara Province, located in the Central Anatolian Region. The main emphasis of this research was wheat and other crops which could be rotated with wheat such as sunflower, watermelon, aspir, lentils, chickpeas, etc. As a result of these studies, a number of bread wheat and eight types of durum wheat cultivars were developed by 1986 (Mizrak, 1986).

In addition, research on tillage and cereal growing techniques was started in the early 1930s. In 1969 the "Turkish Wheat Research and Training Project" was begun

and the research on wheat reorganized. Later on this project was united with the "Barley Research and Training Project" and was renamed as the "National Winter Cereal Research Project." Developing new wheat varieties and techniques in subjects related to tillage and other cultural practices are the main objectives of the project (Mizrak, 1986).

Within the framework of "National Winter Cereal Research Project", through the complementary studies of breeders, pathologists, agronomists, technologists and social scientists, progress has been made in improving high yield varieties of wheat that are resistant to major diseases, cold and drought, and are economically sound with high quality characteristics. Appropriate tillage systems and types of practice that cover every component of growing technique have been developed. The components of the package of practices are as follows (Durutan, 1980).

Recommended Wheat Practices

I. Soil preparation for fallow-wheat system

Initial tillage	Time March 10 to April 15	Equipment Mold board	Depth 18–20 cm
Spring tillage	Time end of May to beginning of June	Equipment Sweep and harrow combination	Depth 6–8 cm
Summer tillage	Time end of July to beginning of August	Equipment Sweep harrow combination	Depth 4–6 cm

II. Seeding

Date	October 1-15	
Rate	18–23 kg/da (Durum Wheat)	15–17 kg/da (Bread Wheat)
Equipment	serial planter	
Depth	4–6 cm	
Quality of seed	High yielding variety (such as Bezostaye, Bolal)	

III. Fertilization

	Rate	Application time
Phosphorus	5–6 kg/da	October 1–15
Nitrogen	5–6 kg/da	March

IV. Weed Control

Application time	March–April
Application rate	140 gr/da

Durutan (1980) noted that to achieve increased production it is extremely important to understand that it requires the application of the combination of practices rather than any individual practice.

The Difficulties of Transferring Technologies

The Ministry of Agriculture, Forestry and Rural Affairs (MAFRA) serves farmers in matters such as animal and plant breeding, home economics and the financing of farm machinery, fertilizers, seeds, and chemicals. Transferring the results of research

done at the Research Institute to farmers is also one of the responsibilities of the government (MAFRA, 1987b).

During the green revolution, the introduction of two main inputs, fertilizer and high yield varieties, to Turkish farmers led to an increase in agricultural production. Crop production more than doubled because of the spread of modern varieties, rapid increase in fertilizer use, mechanization and the expansion of arable land. However, there are still great opportunities to increase productivity and efficiency of agricultural production through increased yields, reduced costs, and improved cropping systems (Byerlee, 1989).

Byerlee (1989) indicated that a new and more complex second generation of inputs such as micronutrients, soil amendments, seed treatment for disease control, more precise planting methods and space, and other management practices play an increasing role in productivity and growth. Investments in better information and skills of farmers to improve economic efficiency in using this wider array of inputs are needed to maintain the momentum in the post-green revolution era.

As Byerlee (1989) indicated, in many post-green revolution areas, the commonly-held image of traditional agriculture is no longer valid. Decision making complexity for small scale farmers is now closer to the situation of farmers in industrialized countries. The farmers in both countries have moved from a science-based to an information-based agriculture. Scientists agreed that second generation inputs often required more information and skills for successful adoption than the earlier introduction of new varieties and nitrogen fertilizer.

In terms of second generation inputs, conventional extension services have not provided enough updated information to farmers. For example, in Turkey, the ex-

tension agency of the Ministry of Agriculture, Forestry and Rural Affairs has sub-agencies in sixty-seven provinces and 550 towns and is represented by 947 Agricultural Engineers, 5377 technicians, and 858 home economists. It is a formidable problem to reach all farmers because Turkey has 3.6 million poly-cultural small family farms. A majority of the farmers live in 35,000 villages containing a couple of hundred houses each. Moreover, most of the extension staff have had to spend a lot of time on non-extension functions such as governing, marketing, and bureaucratic writing (MAFRA, 1987b).

For these reasons, the extension organization could not establish effective communication with either researchers or farmers. Thus, the MAFRA decided to embark on the "Agricultural Applied Research and Extension Project" that is the Turkish version of the Training and Visit System that was set up in 1985 with thirty-five percent of the funding provided by the World Bank. It was designed to be implemented in sixteen provinces, including Ankara. Its purpose was to provide the extension system with a structure and function to facilitate the transfer of technology to farmers. Within the framework of this model, the extension services were organized by the MAFRA at the province, district and village level to transmit research findings to farmers and, conversely, the problems of farmers to the research unit. An additional rationale for the adoption of the Training and Visit System was to improve the frequency and quality of communication. Monthly workshops are now being conducted to permit the flow of information among researchers, extension staffs, and farmers. One of the main activities is conducting demonstration and on-farm research trials in contact farmers' fields (Eyuboglu, 1987). This systematic program of training envisaged the development of close links among village extension worker, extension

subject matter specialists, and researchers.

Statement of the Problem

In Turkey, the existence of some problems with the implementation of the Training and Visit extension system have been pointed out by the researchers (Rolling, 1988; Demirtaş, 1988). It is vital for the better application of the T&V system in Turkey that the problems be clearly understood. This study dealt with the problem of transferring technological knowledge from the researchers to the farmers via the T&V Extension system. Comparing farmers' practices with the improved management package which has been developed and fixed for the Central Anatolian Region by researchers at the Field Crop Improvement Center at Ankara will provide valuable information about the efficiency of the process of transferring technology from researchers to farmers via extension.

Purpose and Objective of the Study

The overall purpose of the study was to assess the impact of the transfer of technology related to wheat production via the Training and Visit System in Ankara Province, Turkey. The specific objectives of the study were:

1. To identify demographic characteristics of farmers in selected villages of Ankara.
2. To identify perceptions of the Training and Visit system by farmers, VEW's and researchers.
3. To determine and assess the adoption level of recommended wheat practices by comparing what is being used by farmers with what has been recommended by

researchers.

Research Questions

The following research questions were to be answered in this study:

1. Was there a significant difference in familiarity with the Training and Visit system (Agricultural Applied Research and Extension project) when respondents were grouped by age, farm size, education and occupation?

2. Was there a significant difference in farmers' perceptions of the quality of extension services received before and after the implementation of the Agriculture Applied Research and Extension project?

3. Were there significant differences in wheat yields when farmers were grouped according to their adoption level of recommended high yielding varieties, tillage, fertilizer, seed rates, and weeding practices?

4. Would farmers, village extension workers and researchers have similar perceptions of the training and visit extension system?

Limitations of the Study

The study was limited to the Agricultural Applied Research and Extension Project, the Turkish version of the Training and Visit System. Other agricultural information systems were not studied.

Under the T&V System, only farming practices related to wheat crop traced from research, extension to farmers.

This study was limited to Ankara Province, Turkey. Because of limited time, money and personnel, it was possible to sample a small number of the approximately 93,000 farmers in Ankara Province. Seven out of twenty-four districts and twenty-one villages within the seven districts were randomly selected, resulting in a final contact with eighty-four farmers. However, in terms of the socioeconomic status of farmers, education level, tradition, culture, planting patterns, weather conditions, soil type, farming conditions in Ankara vary little (Özcan, 1988). Hence, a randomly selected sample of farmers was assumed to be representative of the whole homogeneous population.

Significance of the Study

There was a big gap between available knowledge of improved technology related to wheat and farmers' practices in the seventies. In the period of 1972-1977, the Central Anatolian Field Crop Improvement Center carried out adoptive research trials, particularly in the dryland areas. The yields of the treatment determined as the "recommendable system" were compared with the yields of the adjacent farmers' fields in five provinces of the Central Plateau. The results are shown in Figure 1.1 and Figure 1.2.

As it is seen from Figures 1.1 and 1.2, the recommended system always yielded more than farmers' practices. In addition to that, improved growing techniques were found to be more profitable than farmers' practices. The problem appears to be lack of information between researchers and farmers who might have also needed to be motivated to accept technological change.

Lionberger and Gwin (1982) noted that in order to provide a continuous supply

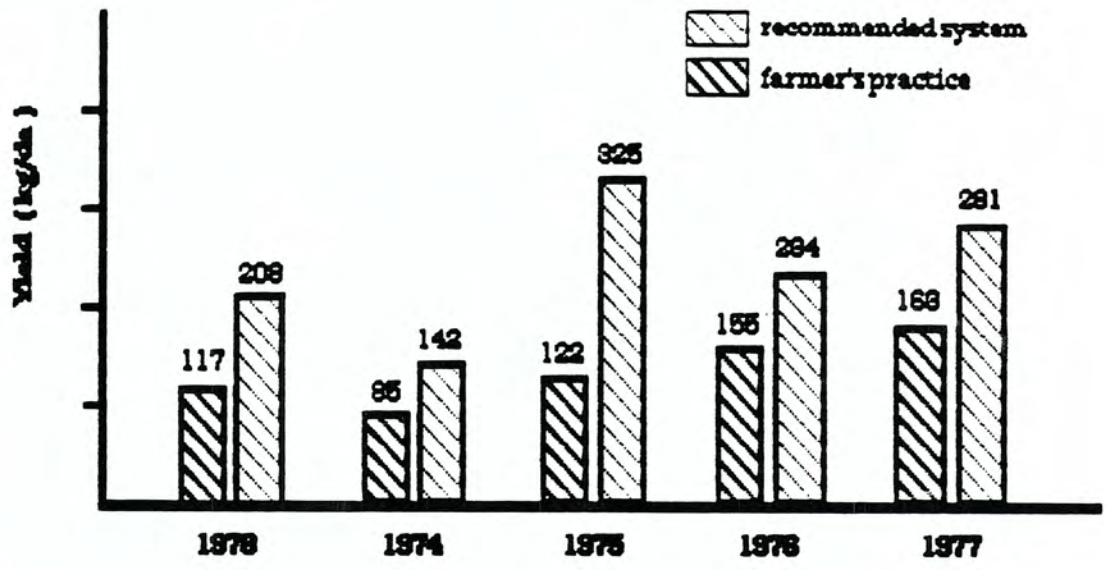

Figure 1.1: Annual average wheat yields on farmers' fields and demonstration plots using recommended system (average of 5 provinces) (Durutan, 1980)

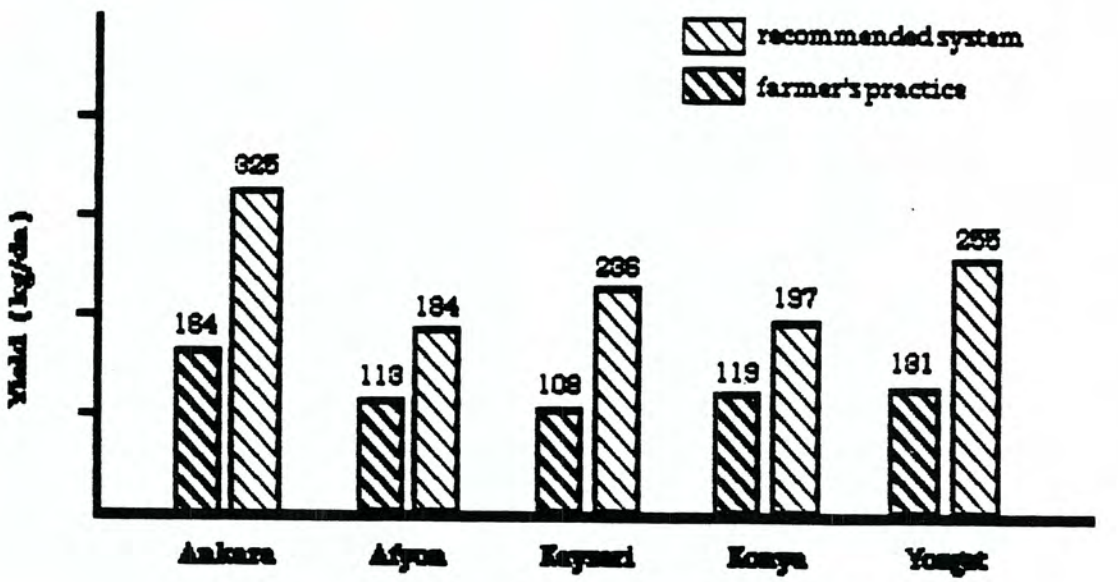

Figure 1.2: Five-year average wheat yields of farmer's fields and demonstration plots using recommended system (Durutan, 1980)

of updated information, the following functions must be performed:

Innovation development of new ideas or practices.

Validation testing of the new idea under field conditions to determine its suitability to local needs.

Dissemination making the new information available to people who might use it.

Information farmers informing one another about what is new.

Persuasion or Legitimation farmers becoming persuaded about the utility of the new idea or practice for themselves.

Integration fitting the new information (idea or practice) into the farmer's own farming system.

Reinforcement keeping new adopters convinced about the utility of new things so they won't quit for the wrong reasons.

The Characteristics of Ankara Province

Ankara Province is located within the Sakarya River basin and the Kizilirmak River basin. The geographic shape of Ankara is steep and broken and covers 1,157,175 hectares of sown area. The altitude of this area is about 1,000 meters above sea level. The average annual precipitation ranges roughly from 250 mm to 450 mm depending on the locality. There are also great variations in different years. For example, it is recorded that in one location the annual amount fell down to 195 mm, and in another year it occurred as high as 557 mm. This unpredictability has always carried the threat of drought.

Nearly 70% of the rainfall occurs in winter and spring. The drought season begins around mid-June and continues until the end of October. This period has very limited total rainfall accompanied by higher temperatures and lower humidity.

Soils of the Central Plateau belong to the Brown Great Soil Group. Generally, the soils are poor in organic matter content, approximately 75% contain one to two percent of organic matter. Since nearly 70% of the soils are poor in P_2O_5, phosphorus and nitrogen fertilizer application has become a standard practice in most areas. On the other hand, most soils are rich in calcium carbonate ($CaCO_3$) and potassium oxide (K_2O).

In Ankara Province cropping land is based on a fallow-cereal rotation using a fourteen month fallow period. Wheat and barley are the most important cereals. According to the latest statistics, most of the total wheat yield is produced in this area by dry farming (Yeşilsoy, 1979).

According to the State Institute of Statistics Prime Ministry, Republic of Turkey (1989), total cultivated area in Ankara province was 1,157,175 hectare. Irrigated area was 97,827 hectares.

As shown by Table 1.4, the planting pattern in Ankara province is very diversified even though more than 60% of the cultivated area was devoted to wheat. Ankara farmers produce large amounts of fruits, including pears, apples, plums, sour cherries, pistachios and mulberries, as well as vegetables and animal products.

Operational Definitions

Farmer The person who controls the farm land and is responsible for decision making processes affecting the farm.

Table 1.4: Percentage distribution of area sown and production of major crops in Ankara

Crops	Area (hectares)	Production (tons)	Yield (kg/ha)
Cereals	962,189	2,246,890	
Wheat	755,894	1,701,272	2,254
Barley	201,307	534,748	2,656
Oats	2,687	4,059	1,511
Others (maize, millet, rice, etc.)	2,301		
Pulses	111,145	131,207	
Chick pea	32,124	43,563	1,359
Lentil	37,997	45,866	1,207
Crown vetch	38,425	36,840	959
Dry bean	2,594	4,934	1,902
Industrial Crops	27,916	550,904	
Sugar beet	15,456	543,974	35,318
Others	12,460		
Oil seeds	52,749	44,001	
Sunflower	52,749	43,905	833
Tuber Crops	3,176	54,021	

Field Crop Center The national institute of Agricultural Research Center that works in agricultural research, including plant breeding, plant pathology, agronomy, and extension work in Ankara, Turkey.

Agricultural Extensionists Those persons employed by the government extension service, whatever the position or task they perform, including agricultural extension administrators, subject matter specialists, and village extension workers.

Extension Agency A governmental agency with the purpose of diffusing research-based information related to agriculture to farmers through demonstrations and publications.

Tillage A field operation performed with specifically designed implements to manipulate the soil conditions to favor plant growth.

Agricultural Information System "an agricultural information system is a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergistically to underpin knowledge utilization by agricultural information system" (Rolling, 1988).

Improved Management Practices All recommended operations included in growing a crop such as tilling, planting, fertilizing, irrigating and pest management.

Winter Wheat A wheat that requires vernalization (exposure to a cold period) before it can begin flowering.

Variety A wheat that is genetically uniform. Cultivated varieties (cultivars) are approved, named and released by the government.

Fallow A period when the soil is kept free of plants so that moisture can be stored and nutrient levels can be built up.

Agronomy The practice of producing agricultural crops. The art and science of crop production.

Perception An immediate judgement or any act or process of knowing objects, facts, or truths, whether by sense, experience or by thought.

Familiarity A state of close relationship, or close acquaintance with something.

Training & Visit System T&V System is an extension system which was first developed by Daniel Benor to enhance the effectiveness of the extension system in developing countries. The main characteristic of the system is the establishment of a two-way flow of information between research extension and farmers to deliver selected timely and relevant technology to farmers, especially small-scale farmers.

Summary

In Turkey, the innovative function or research on wheat production for dry farming has been well performed by research institutions especially in Central Anatolia's so-called "dry land success" (Hanson *et al.*, 1982). On the other hand, integrative and dissemination functions have not been performed well enough by the research

and extension organizations until the implementation of the Training and Visit System. The progress of technological change at the farm level has lagged behind the improvement in research based knowledge about wheat. This study was an attempt to find out the effect of the Training and Visit System on the wheat technology, to determine the constraints in narrowing yield gap between research plots and farm production.

Identifying the current agricultural practices of wheat production and defining the problems faced by farmers should help determine whether or not recommended practices meet the needs of the farmers who produce wheat crops in Ankara province. Also, it is essential to investigate the impact of extension's efforts to reach farmers through the Training and Visit system.

This study can supply valuable information to extension administration, extension staff, researchers, and more importantly, to farmers. There is limited research regarding the identification of farmers' needs related to wheat production and insufficient evaluation of the extension effort in local conditions.

CHAPTER 2. RELATED LITERATURE

The purpose of this study was assessing the impact of the transfer of technology related to wheat production via the Training and Visit System in Ankara Province, Turkey. In order to provide theoretical background for the study, the review of literature is divided into:

- Agricultural information systems
- The Training and Visit System
- The agricultural information system in Turkey
- Diffusion and Adoption of innovations
- Monitoring and evaluation of extension systems.
- Summary

First, however, it is worthwhile to review elements lacking in agriculture in most developing countries and recommended alternatives to increase the productivity and efficiency of the agricultural sector. Arnon (1981) noted that overall development is not likely to occur unless agricultural productivity is increased as a prelude to industrial growth. However, during the modernization era in developing countries (1950-1960), most of the scientists did not view agriculture as an important contributor to

development. Abstract theorizing, inadequate attention to the need for technological change in agriculture, lack of attention to the biological and local-specific nature of the agricultural production process, and lack of a solid micro foundation based on empirical research at the farm and village level were some of the shortcomings of the 1950s and 1960s agricultural development era (Staatz & Eicher, 1984). According to Staatz and Eicher (1984), development experiences and conducted research indicated the need to emphasize the following components in the coming decades if more rapid and more broad-based agricultural growth and rural development were to be achieved.

1. Institutions in low-income countries dealing with agricultural research, administration, policy analysis, and training must be strengthened.

2. Roles of international trade, food aid and agricultural specialization must be re-evaluated in light of an increasingly interdependent world food economy.

3. Analysis of agricultural development issues within broader macro economic frameworks must receive renewed emphasis.

4. Interdisciplinary approaches to problem solving must be established.

These components require expansion of the human-capital base of Third World countries. Staatz and Eicher (1984) emphasized that one of the most important lessons of the 1960s and 1970s is that strong local institutions and well-trained individuals are necessary for agricultural and rural development.

Scientists have agreed that a substantial increase in agricultural production and efficiency depend to a great extent upon well established institutions, such as, educational, training, and research institutions, experiment stations, and effective extension

services. Also required are the contribution of relevant supply of credit, transportation, and marketing facilities.

Blase (1971) noted that many institutions affect the agricultural sector of developing nations. Some are more closely identified than others. Closely identified with the agricultural sector are group tenure institutions, extension programs and agricultural research institutions. According to Arnon (1981), the modernization process of successfully transforming subsistence agriculture is generally complicated and difficult. Four related functions that have to be simultaneously developed are:

1. New technology has to be generated, implying an effective research organization.

2. The new technology has to be rapidly transferred to the farmers, a process that requires an efficient system of education.

3. The essential incentives and conditions have to be provided to motivate the majority of the farmers to change their methods of production and to enable them to do so successfully.

4. An appropriate strategy for promoting the entire process must be devised and implemented. It can be understood that these related or interdependent functions need to be performed within the macrosystem.

Agricultural Information Systems

Havelock (1971), who conducted a comprehensive study on the subject of information generation and utilization, defined the macrosystem as consisting of four

interrelated and interactive subsystems: research, development, practice, and consumption. Within the macrosystem, Havelock stressed, there is a need for establishing and maintaining linkages among the subsystems. He also emphasized the importance of building linkages within each of the sub-systems. According to Havelock (1971), reciprocal and collaborative relationships are not only within a variety of potential users but also within a large and diverse group of other resource systems. He expressed that within the macrosystem the main task is to bring knowledge-production and utilization subsystems into effective linkages with each other, to serve a common purpose, the public interest.

Nagel's system (1980) , the agricultural information system based on Havelock's model, is comprised of 1) research sub-system, 2) dissemination sub-system, and 3) user sub-system. Six basic functions must be performed within the system in order to complete the information flow process:

1. Identification of knowledge needs at the producer level;
2. Generation of innovations;
3. Operationalisation for utilization;
4. Dissemination;
5. Utilization;
6. Evaluation of experiences.

According to Jean Blunen and Schram (1983, p. 2),

> A fundamental tenet of system theory is interdependency, that is, each component of a wider system effects and is influenced by every other component. A 'problem' or dysfunction in one part is a 'message' to the whole system. A system perspective suggests that difficulty in any one component is a problem for the system. As in biological ecostructures, no unit is an 'island' but rather a reflection of the whole. Sub-units within any organization such as extension or research may interact, communicate, negotiate and establish territory.

According to Rolling (1988, p. 33),

> An agricultural information system is a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergistically to underpin knowledge utilization by agricultural information system.

According to Rolling, the agricultural information system is firstly, a complex phenomenon; government departments, commercial companies, foreign experts, consumer lobbies, various types of farm men and women, intermediate organizations and other institutions are all part of that phenomenon. Within the agricultural information system various top-down, bottom up and horizontal flows of information and transformations take place. Secondly, the agricultural information system is also a created system, such as T&V and farming system research. Therefore, the design of information systems for the management of large organizations is becoming more and more important in an increasingly complex society.

Rolling stated the following advantages of the systems approach:

- It centers on interactions between elements instead of their nature.
- It emphasizes the effects of interactions instead of their nature.
- It is based on a global view, instead of on precision of details.
- It seeks to validate facts by comparing models with reality instead of experimental proof.
- It uses models which might not be very rigorous but can be used for decision and implementation.
- It is multidisciplinary rather than monodisciplinary.
- It focuses on exact knowledge of objectives and imprecise knowledge of details, instead of vice versa.

In order to perform effective agricultural information or knowledge transfer, it is necessary to develop all subsystems simultaneously and to establish and maintain an articulated relationship among the subsystems. Isolation of one of these subsystems will probably bring about incomplete transfer of information processes.

Lionberger and Gwin (1982) noted that to understand how the information development and supply systems are organized, Four elements need to be studied: 1) the function that must be performed in the total operations, 2) the theory-to-practice continuum of development that must take place from the time the basic science knowledge is developed until a portion of it is turned into a usable invention and put into use, 3) the specialized social subsystems that must be developed and that must become properly linked to sustain the flow of information to potential users, and, 4) the basic concepts that prescribe how the system should run and for whom.

In his system, all information is assumed to be science based. Whereas interactions between agricultural scientists, agricultural extension staff, and indigenous small-scale agricultural producers have increased in recent years, such interactions have been the result of a variety of forces, and they have been facilitated in a number of cases by formally recording the indigenous agricultural knowledge upon which cropping or animal husbandry behavior is based (Warren, 1989).

Before reviewing agricultural information systems in the USA and other countries, it is useful to define the extension system in order to avoid misunderstanding caused by terminology, as the perception of the definition of extension is different among nations. "Extension" is used to describe a wide range of activities throughout the world. In many nations, the term is used to describe the governmental function that extends various services to farmers and administers regulations and may even enforce policies related to agriculture. The tasks of extending technology and education are mingled with others. This is, in fact, the most widely used meaning of the term in the international setting (Interpaks, 1).

Extension can be defined as a system of disseminating educational know-how from a university/research station to rural people. Another definition of extension education is a non-formal educational process which involves out of school education for youth and adults.

There are three conceptual models in common use in terms of the mission and role of extension:

1. Information-transfer model (research-transfer model)

2. The problem-solving model

3. The educational delivery model

The information-transfer model is based on the outputs of research agencies. The results of the conducted developmental and adaptive research is transferred to users. Feedback information from the users to research agencies determines the research topics.

The problem-solving model is based on clientele needs and the aim of the model is helping people to help themselves. Boyle (1981) indicates that this model identifies major problems of clientele, communities or segments of society after which an educational program to help people successfully solve or cope with the problems can be developed. In this model extension programs are based on extension assessment of users and relevant outputs of research agencies with education's contribution being problem-solving.

The third, the educational delivery model, is sometimes called the continuing education, adult education or educational program model. The aim of the model is to increase the knowledge, skills and capabilities of individuals. All three models are continually being renamed and redefined, yet the underlying characteristics remain the same. According to Patton (1987), extension is going through a period of change. Organizational soul-searching, strategic planning and re-organization are all evidences of change and transition.

All of the models have been and continue to be used. The future mission and role of extension is heavily dependent on which model is emphasized. The main characteristic of the models is to increase the capacity of the people through education, the best means of development.

Understanding of the agricultural information system and structures in the USA

and other developed countries can facilitate an appreciation of the problems and prospects of developing these types of institutional structures in developing countries.

Flora and Flora (1987, p. 8) noted

> The agrarian transformation in the industrial revolution in the early nineteenth century and snowballed from World War I to present. It was to a considerable degree a technological transformation ...it occurred because of social, political, and economic traits in the U.S. system. Agrarian changes were always linked to and usually dependent on the urban-industrial transformation and the institutional structure that engendered it.

The 1962 Morrill act promoted the idea that education be made available to anyone, not just the privileged few. More importantly from the extension point of view, it established the Land-Grant Colleges which provided the perfect administrative base for an organized, structured system and helped the service attain its main objective: "to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and application of the same" (Blackburn, 1984, p. 7).

Experiment stations were established in 1887 under the Hatch Act, and the Smith Lever Act of 1914 which authorized the extension service in the USA. The characteristic of the USA agricultural information system is first, establishment of a research-subsystem (Land Grant Colleges), then the experiment stations and finally the Cooperative Extension System. Compton (1989) pointed out that the Hatch Act and Smith-Lever Act simply legitimized and strengthened the research and extension components of the Land Grant University.

Lionberger and Gwin (1982) noted that the Land Grant colleges were funded originally, one per state, by grants of federally owned land. States then sold the land to help finance building of a state college. The colleges have since become universities. When professors began preparing agricultural courses to teach at the colleges of agriculture, it quickly became apparent that the subject matter was inadequate. To solve this problem, agricultural experiment stations were added in 1887 to develop scientific knowledge to teach, ...finally, in 1914, a Cooperative Extension Service was established and charged with the responsibility of disseminating information to farmers. The mission of the extension service in the USA is, through education, to disseminate and encourage the application of research-based knowledge and leadership techniques to individuals, families and communities.

Greenwood (1985) pointed out that Cooperative Extension is teaching people how to live as well as how to make a living .... Extension's policy on technology transfer places a high priority on transferring technical information or "know-how" based on research and knowledge from state Land Grant universities, federal research laboratories and the private sector including industries and foundations. Transfer of such information has been basic to extension programs designed to meet the needs of farmers.

The Land Grant College system in the USA integrates the functions of teaching, extension and research. An important characteristic of this system is the involvement of people identifying problems and priority items to be addressed through the extension system.

Since the early 1900s, the Cooperative Extension Service in the U.S. has brought about significant development within the rural areas. Blackburn (1984) stated,

Many interesting and significant developments have influenced the Cooperative Extension Service evolution.

The Cooperative Extension Service in the U.S.A. is widely acknowledged as the largest problem-solving educational system in the world. In other words, the system has proven its usefulness up to this time (Vines & Anderson, 1976).

In the U.S.A., certain technical, economic, social and political conditions and policies resulted in successful implementation of the extension system.

There are a number of policies and practices that have had significant influence on U.S. extension programming (Interpaks, 1):

1. Local counties or appropriate local political sub-divisions have been involved to provide an overview perspective, to provide a portion of the budget, to influence selection of personnel, and to evaluate both personnel and programs.
2. A procedural system has been established to involve local representatives of the target audiences in determining the local programs.
3. Programs have emphasized learning by doing.
4. An experiment station has conducted significant problem solving research and serves as the authority for the accuracy of subject matter taught."

These policies and practices, with the contribution of high quality human resources, notably scientists, engineers, technicians, managers and most importantly the involvement or participation of the local people have given rise to today's exten-

sion system in the U.S.A. Rolling (1988, p. 194) explained the Dutch Agricultural information system.

> The Dutch system is a far cry from the transfer of technology model. The essential aspect of the system is that it is a highly interconnected network of researchers, adaptive researchers, specialists, extension workers, teachers, agri-businessmen and progressive farmers who meet each other regularly in different organizational and social contexts. Farmers are highly organized and participate in the formulation of research and extension policies. They pay half the cost of adaptive research and sometimes of special government extension services.

On the other hand, most developing countries are still struggling with establishing effective extension systems. Today more than sixty percent of the population in developing countries live in rural areas and engage in agriculture. Their production is hardly sufficient to meet their basic consumption. Thus, most of the rural population are virtually outside of the market of manufactured products. Also, the rural population are deprived of education. Lack of education and economic power have also excluded the rural population from politics. It means the major problem of developing countries is that they are not able to use efficiently their potential (Şen, 1978).

Therefore, developing countries should give priority to rural development in order to integrate rural areas into the general economy. Also, this integration will reduce poverty, increase employment, capability, income, savings and demand for new technology. A look at the process of development in developed countries such as the United States, Japan, and the United Kingdom, helps in understanding the

importance of the extension system in the rural development.

Hayward (1987, p. 1) concluded,

> Extension is one component in an array including research, training, education, marketing, international trade, etc., which developing together brings about growth, and it is sustained growth with equity which must be our highest priority.

The implementation of the U.S. Cooperative Extension has been the subject of great interest, especially in developing countries. Most of the developing countries have established their own extension organizations which are a modification of the U.S. Extension organization.

The World Bank, USDA and IFAD have been significant supporters of agricultural extension in developing countries. According to Benor (1987), between 1965 and 1986, the World Bank funded 460 projects in 79 countries that supported agricultural extension mainly for crop production. The extension components of these projects were estimated to cost $4,027 million of which $1,807 million was covered by bank loans.

However, extension efforts have not always achieved their objectives in developing countries. Navaratnam (1982), identified in his study the following problems faced by developing countries. Some of them were:

1. A lack of formal functional relationship between the agricultural extension and universities.

2. Trickle down effect. Usually government prepares the framework fo the extension programs.

3. The lack of job descriptions for extension personnel contribute to confusions in their duties and responsibilities.

4. Extension personnel are assigned non-extension duties besides extension work.

5. The agricultural extension generally does not involve organized clientele committees in the program planning process.

6. Evaluation of extension programs is neglected in agricultural extension.

7. Effectiveness of the agricultural extension activities is limited due to lack of inter and intra-agency relationships between extension and other service organizations.

8. Youth activities have been neglected for many years.

9. The methods of approach adopted in the agricultural extension lead to neglect of many clients.

As Rolling stated, the agricultural information system is a complex and also adaptable and flexible system. However, imported extension models from the developed countries and the U.S.A. are not always perfectly adoptable. For this reason several extension models (T&V, on-farm research, etc.) were developed by the scientists in order to eliminate problems faced by the developing countries during the implementation of the extension system.

The Training and Visit System

After 1980, the greatest project supported by the World Bank was the Training and Visit System (T&V). The T&V system was first developed by Daniel Benor and

was originally tested in Turkey in 1967 (Benor & Harrison, 1977). During the implementation of the Seyhan irrigation project in the southern part of Turkey, project managers and Benor felt that existing conventional extension methods in Turkey were simply not reaching the intended consumer, because at that time there were limited personnel at the province and district levels. In addition, there were not extension workers at the village level to build linkages between technicians and the farmers. In order to build linkages between the extensionists and the farmers in the field, irrigation foremen, who were located in each of the selected villages, were selected from among farmers, according to the following criteria:

1. to be accustomed to the farmer's conditions
2. to be old enough to influence the farmers and young enough to serve actively in the field
3. to have a certain educational background
4. to be able to establish communication with farmers

Before starting to work with farmers, foremen were trained. The principle of this system was: "Learn it just before using it." This new approach to extension brought about a tremendous increase in cotton yields, from 1.7 tons to more than 3 tons per hectare in three years (Benor & Harrison, 1977).

Essentially the T&V system still follows the basic model for generating and distributing agricultural information. According to Benor (1987), the basic goal of the T&V system was to build a professional extension that was capable of assisting farmers in raising agricultural production and/or income and providing appropriate

support to agricultural development. There could be no one system of extension suited to all farming communities. The variation in agro-ecological conditions, socio economic environments and administrative structures is such that one system could not be expected to suit all conditions. However, he explained seven fundamental principles of the T&V system.

1. Professionalism means an extension service that is professional in all senses; to be successful, extension workers at all levels need to be trained continuously to handle their particular responsibilities.

2. Single line of command: Agricultural extension services to farmers must be unified under a single line of command within an appropriate ministry and department.

3. Concentration of effort is a feature of all aspects of the system. Extension workers need to devote full efforts to extension.

4. Time-bound work: Technical subject matter specialists must discuss technical recommendations for a specific area and for particular farming conditions with research on a monthly basis, and subsequently teach extension agents on a frequent, regular basis.

5. A field and farmer orientation: Extension must be in contact with farmers. This contact with farmers must be on a regularly scheduled basis and directly with farmers representing all major farming conditions and socio-economic types of the broader farming community. Moreover, all extension staff from first-line supervisors to the service director, as well as researchers and others involved

in agricultural services, must have frequent exposure to farmers in their fields and villages.

6. Regular and continuous training of extension workers is required to teach them the specific production recommendations to be discussed with farmers in the coming weeks, and also to upgrade generally the professional skills of extension staff.

7. Two-way linkages between agricultural extension and research: Problems faced by farmers that cannot be resolved by extension filed staff and their subject matter specialists must be quickly forwarded to research. Improvements in technology developed by research must be equally quickly fed into the extension system to be discussed with farmers with appropriate resources (Benor, 1987).

One major deficiency of the agricultural extension system in most developing countries is the quality and effectiveness of the linkages between the various subsystems. The T&V system is designed to improve these linkages.

Benor and Harrison (1977) suggested that the most essential management principle is to establish a single line of command from the governmental agency to the field level extension worker. They also pointed out that unless this agency has full administrative control of the extension service, it is not possible to carry out extension systematically and effectively.

According to Benor and Harrison (1977), political opposition and administrative difficulties did often pose barriers to this initial transfer. However, when officials were able to recognize that the conventional extension system was achieving very few results, and the agencies involved had little to lose, these barriers were usually

overcome.

Another common problem was that extension workers were often linked to too many groups and roles. The workers would usually be given numerous responsibilities including regulatory work, procurement, and the collection of statistical data. Also, besides the agricultural work, extension advisers would devote considerable time to rural development, health, nutrition, and family planning. These numerous responsibilities made it virtually impossible for the extension worker to perform his duties. It also made it impossible to achieve the close, regular contact between the extension personnel and the farmers. This contact needs to be performed for effective extension. Under the T&V system these links are severed and extensionists devote all their time exclusively to professional agricultural extension work (Benor & Harrison, 1977).

The link between extension and research activities was usually another weak link. To promote good communication and ensure proper technology transfer, research institutions and the extension service needed to maintain close contact. Often barriers would arise to make this difficult. Sometimes the two interdependent organizations have their headquarters in different locations, or they might simply have different conceptions of their purpose.

With these barriers hindering the link between research and extension there was usually no flow of informational recommendations suited to farmers' real problems. Benor and Harrison (1977) suggested that lack of linkage leads the researchers to focus their work on technically optimal situations rather than on practical field conditions. Consequently, the recommendations the extension service offers farmers are often inappropriate to farmers' needs and their technical and financial capabilities.

To help strengthen this link the T&V system established research and extension committees at the province and district headquarters levels. These committees included representatives form the research and extension sub-systems. They had responsibility for developing recommendations for the extension service to transmit to farmers, evaluating past experimental data, and communicating the main problems faced by farmers that needed to be solved by researchers.

These committees were also used to oversee a program of field trails which were utilized to validate research experiments. These field trials, which were carried out in farmers' fields, provided a final testing for research findings before they were recommended by extension on a large scale. They also provided a mechanism for close continuous working relationships between researchers and extension staff.

One other link which needed to be carefully defined and developed was the link between extension and input suppliers. Sequence is virtually important in the establishment of this link. As the influence of the extension service grows, farmers usually begin to demand more inputs. At this point, the suppliers may need to be strengthened in order to provide needs. The extension service may also have to increase communication with both sides. Under the T&V system, contact with suppliers is usually maintained through the regular extension training sessions. The supply agencies send their representatives to the sessions so they learn about the recommendations and possible demand for inputs. This allows activities to be coordinated and also keeps the extension staff informed of the input supply position so that recommendations are consistent with the available supplies. Experience with the extension service so far indicates that with such linkages, input supply agencies respond relatively quickly to the demand generated through extension (Benor & Harrison, 1977).

Ultimately, the T&V system was designed to meet with the approval of the local farmers. Under the T&V system, a Village Extension Worker (VEW) is required to live in the area in which he works. Then, each VEW area is divided into groups of farms so as to allow him to visit each group once a week or once per fortnight.

These visits are designed to provide regular face-to-face contact with the local farmers. They allow the VEW to check progress, note problems, and discuss what needs to be done until the next visit. Time is also set aside for group discussions on relevant topics or field demonstrations.

The main characteristic of the system is to establish a two-way exchange of communication between farmers, extension services and research centers. To achieve this objective, the organization of the system should be set up by nation, region, district, town and village levels. The structure of the system is designed to deliver selected, timely, relevant technology to farmers with certain regularity. The system not only delivers new technology to the farmers, but also conveys farmers' problems to the research center to guide the researchers to do research in order to solve the farmers' current problems. This system recognizes the impossibility of village extension workers maintaining regular contact with most of the farmers directly. Therefore, specially selected "contact farmers" are chosen to help spread the necessary information.

As explained by Benor and Harrison (1977), the technical advice spreads from the extension agent in two ways. First, the other farmers see what the contact farmers try in their fields and the results they achieve. This helps generate initial interest. Secondly, each contact farmer is asked to explain the recommendations he has received to several friends or neighbors, and to help them adopt the recommendations. The diffusion process will be further enhanced by the scheduled group activities. By

utilizing these established social groups, the adoption of the improved practices is able to spread rapidly to a large proportion of farmers.

Hayward (1987, p. 3) noted that

> The essence of T&V is its adherence to fundamental management principles as they would apply to any geographically scattered operation which aims to change the behavior of many technologically isolated individuals using poorly educated staff.

There are different approaches to the T&V system. According to Compton (1989, p. 22),

> The training and visit system is a highly rigid system which emphasizes an intricate and carefully supervised schedule of visits by frontline extension workers to a given number of villages within a two-week period, followed by bi-weekly training sessions conducted by subject matter specialists. For those frontline workers this system also emphasizes extension worker meetings with a select number of 'contact' farmers. The T&V system makes it impossible for extension personnel to have the amount of quality interaction with farmers that would lead such extension agents to a fuller and healthier understanding of indigenous agricultural knowledge.

Hayward (1987) pointed out that embodied principles of the T&V system are not a recipe to be followed indiscriminately. Unfortunately, it has become associated with precise staffing patterns, fixed extension worker to farmer ratios, visits to contact farmers every ten days, etc. These are the details of the system. T&V is a flexible system, allowing adoption according to geographical and socio-economic conditions,

to the types of methods, to the stage of development of customers and to changing environments.

Rolling (1988) noted that in the T&V system, the emphasis has been on the linkage of research and extension information sub-systems through fortnightly training and enhanced roles for subject matter specialists as liaison officers. The extension function is not supposed to be diluted by other functions (such as input distribution, data collection or credit supervision), but in a number of countries (including Turkey), adapted T&V systems have been developed to take account of mixed problems.

According to researchers, the problems faced by the developing countries with the implementation of the Training and Visit system are as follows:

- The impacts of the T&V system are hard to quantify. (It is not easy to conduct evaluation, to measure farmers' perceptions that extension advice has improved their lot.)
- It needs ten to fifteen years to establish or to institutionalize a T&V system.
- Farming population and the extension staff need reorientation and retraining. Basic training of new recruits, both subject matter specialists and village extension workers, is inadequate.
- The link among the Research Center, Extension workers, farmers and coordination with other organizations is weak.
- Opposition to the system among the extensionists is one drawback of the T&V system.
- Good management and effective leadership are lacking.

- The selection of contact farmers is not adequate.
- The most crucial problem hindering regular extension visits to farmers is the lack of adequate transportation.
- Budgetary constraints are the greatest obstacle in carrying out extension service through the T&V system.
- Researchers give a low priority to the training of extension workers.

Related Research

Feder, Slade, and Sundaram (1985) evaluated the role of the T&V extension system in facilitating the adoption of improved practices by different classes of farmers, assessed the impact of extension on the use of various inputs and evaluated the ex post farm level impact of extension efforts on cropping patterns and yields. Research was conducted in two districts of India. The main conclusions were as follows:

- Contact farmers tended to be selected from among the larger, more educated and wealthier farmers.
- Ninety-five percent of paddy cultivators in the sample grew high yielding varieties.
- There were no particular differences between smaller or larger farmers or between contact and non-contact farmers in terms of nitrogen use, however, only forty-two percent of contact farmers used phosphate on the paddy, and the adoption rate of phosphate among larger contact farmers was a significantly

lower twenty-three percent. The adoption rate for potash was quite low among all groups of farmers.

Another study by Feder and Slade (1983) was conducted within two districts also in India. One of the districts was covered by the T&V system of extension while the other was covered by an earlier system of extension. They found that the T&V system was more successful in delivering information to farmers than the traditional system.

Oddvar (1975) conducted a comprehensive study on the agricultural development of Turkey. Some of his relevant conclusions were:

1. Large and medium-sized farms led the way in the modernization process.

2. The risk and uncertainty in agricultural production was much higher in the dry, rainfed areas than in the wetter, lightly irrigated coastal regions. Moreover, small farmers operating at marginal living standards could not take the economic risks that were involved in innovations.

3. The government's agricultural research and field services had been strengthened.

4. The improvements in the field of general education, the rapid increase in the availability of transistor radios, and improvements in transportation and communications had facilitated the spreading of new ideas and of improved agricultural technology.

5. In areas with tightly knit village communities the farming system tied the villagers together; thus a new crop rotation might be difficult to introduce to

individual farmers. The best strategy might be to work with the village as a unit.

6. To achieve more rapid introduction of improved high-yielding technology, more effective agricultural extension was needed. The present extension staff was overburdened with reporting and regulatory functions, and often the agents lacked the practical experience and farming background to communicate successfully with the farmers.

He pointed out that effective in-service training programs in improved farming technology would help to better this situation.

Aresvik (1975) argued that the typical situation in Turkish villages calls for a special strategy in the introduction of new technology, "one has to work with the village as a unit, not with the individual farms."

Demirtaş (1988), in his study related to the agricultural information system in Turkey, concluded that, although there were a number of research organizations in Turkey, their activities were uncoordinated.

- The organizational structure of the extension system in Turkey was not the same as suggested by the T&V. However, it was acknowledged that any system of agricultural extension could not be transplanted to a new area without necessary modification.

- The T&V focused change efforts on individual farmers using contact farmers as the point of contact in the diffusion of innovation. Since basic decisions in Turkish communities required community interactions, the T&V system could

not be effective in introducing these changes which depended on community or group decisions.

- The T&V system remained a top-down approach.
- In T&V, the starting point in planning was recommendations instead of people's problems and needs.

Rolling (1988) examined the agricultural information system in Turkey. He observed the following problems about the implementation of the T&V system.

- One could not give a large loan to a country to improve its extension service according to the T&V system without also improving the agricultural research system. As it was, implementing T&V required a complete reorganization of agricultural research, and creation of regional stations capable of answering to regional problems.
- The T&V system assumed a context in which farmers grew a high value commodity monocrop, with extension workers as crop specialists. Subject Matter Specialists were specialists in problems related to the crop and the research station focused on the same crop. But what happened if the research station specialized in sunflowers, the subject matter specialists in dairy production, the extension workers in irrigated wheat.
- Agricultural administrators at the provincial level and below were used to asking for budget resources on a project basis. When a project ended, the benefits it brought ended too. The T&V system was introduced as a project. Thus, it

was followed where bank money was being spent, but nowhere else. There was no model of how an agricultural information system was supposed to function.

- Rolling (1988) criticized the macro context of development activities.

  > I found the Turkish scenario for agricultural development based on the scarcity paradigm which led to agricultural development plans emphasizing high potential areas (and especially irrigation), efficient farmers and investment to accelerate agricultural production.

- The T&V system required a certain extension/farmer ratio and a regular distribution of staff across provinces. Unfortunately, the Ministry of Agriculture, Forestry and Rural Affairs (MAFRA) had traditions which impinged on this need. Staff were promoted from positions in the black eastern provinces to the sunny, sophisticated Mediterranean west. They started east and ended up west.

The Agricultural Information System in Turkey

In Turkey, the three aspects of the agricultural information system are research, dissemination and utilization. The research sub-system corresponds to universities and government research institutions. The dissemination function is performed by the government extension organization. The utilization sub-system covers the Turkish farming community.

Research subsystem

Agricultural research is essential in order to learn how to overcome, partially or entirely, the limitations imposed by the natural environment and how to make the

most effective use of the potentially favorable resources (Rolling, 1988).

According to the International Handbook of Universities (1986), and the Ministry of Agriculture, 1983, there are 59 research organizations which fall within nine agricultural regions in Turkey. (See Appendix D.)

All of the agricultural universities, in addition to their teaching functions, are dealing with basic agricultural research. Applied research, on the other hand, is done by government research organizations. Recently, several private seed companies, (most of them joint ventures including the Pioneer Overseas Company) have been dealing with applied research and extension activities (Demir, 1987).

Manpower and funding are the two most common indicators which provide basic knowledge about the activities of governmental agricultural research organizations in Research and Development (R&D). Universities tend to put manpower and funding into basic agricultural research, leaving the applied research to the government and recently, private companies (Demir, 1987).

According to the Turkish Ministry of Agriculture in 1983, 1,590 scientists and engineers were engaged in professional work on agricultural research and experimental activities. In the same year, expenditures for the whole research and development activities in Turkey was .2% of the Gross National Product (MAFRA, 1987a).

The Structure of the Extension System in Turkey

The agricultural extension work in Turkey is undertaken by the Ministry of Agriculture, Forestry and Rural Affairs. The function of the Ministry of Agriculture has been changed several times. However, the last change, which was made in 1985, was the biggest and the most important one.

The main reason for reorganization has been declared by the Turkish Ministry of Agriculture (1985) as follows:

- the reorganization of the ministry has been directed from a subject and crop base to a functional base, from routine service to integral agriculture and rural development
- the reorganization has been based upon fundamental political changes within the state ministry instead of technical and routine service

Organizational changes which occurred at both the headquarter level and the provincial level include:

At the headquarter level, in order to reorganize the Ministry of Agriculture nationwide, three general directorates were established and their function changed from a subject and crop base to a functional base. These are shown in Figure 2.1 and are:

1. Projection and Control General Directorate,
2. Protection and Application General Directorate,
3. Support and Organization General Directorate.

In general, their duty is to plan and program development of the agricultural sector and to support organizing farming and rural families according to national targets.

The provincial Directorate of Agriculture has three hierarchical levels; province, district and village. There are six main units and an administrative and financial branch that are headed by branch directors who are district directors and are supervised by the provincial directors of agriculture. The following (Figure 2.2) are the

major duties of the branches of the provincial directorates of agriculture (MAFRA, 1987b).

- Project and Statistical Branch; collecting statistical data, determining production potentials, calculating production costs, preparing and implementing projects, and programming inputs (fertilizer, seed, etc.).
- Plant Protection Branch; carrying out crop quarantine services, controlling pesticide distributors, diagnosing plant pests, diseases and weeds, and implementing and participating in government plant pathology and entomology activities.
- Animal Health Branch; controlling animal diseases and animal movement and taking preventative and curative measures against animal diseases, and determining vaccine, serum and medicine needs.
- Farmer Training and Extension Branch; preparing and implementing the extension program, transmitting newly developed agricultural technology to farmers. Training leader farmers and rural women in home economics. (Figure 2.3)
- Support Branch; encouraging farmers to establish agricultural cooperatives by providing technical and financial assistance, low interest loans based on projects to farmers who live in forestry villages, and developing handicrafts within the province.
- Control Branch; enforcing laws and regulation regarding food, feed and fishing periods and methods.
- Administrative and Financial Branch; supplying vehicles, equipment and facilities, and maintaining them in good condition, managing personnel affairs and

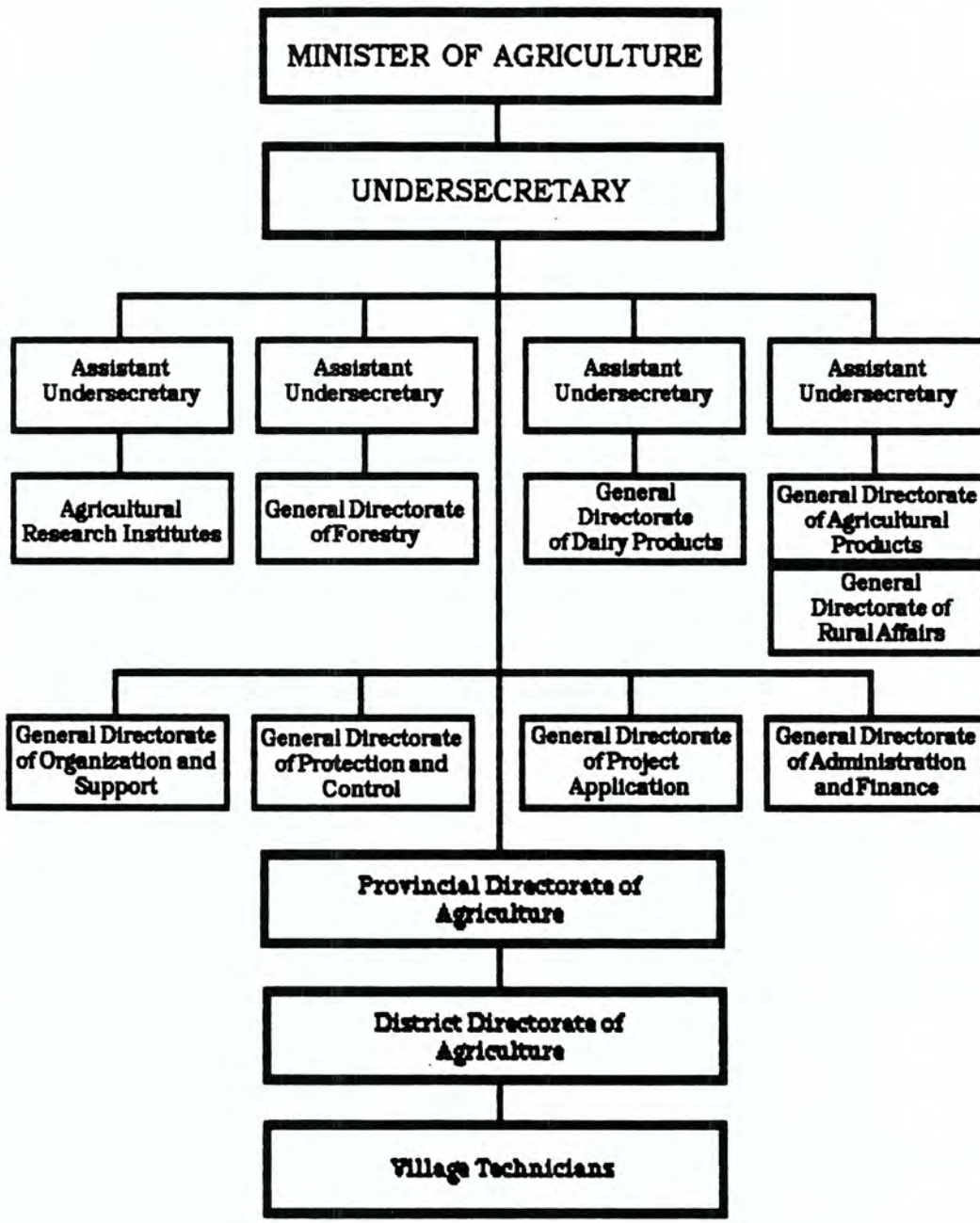

Figure 2.1: The structural organization of the Ministry of Agriculture, Forestry, and Rural Affairs

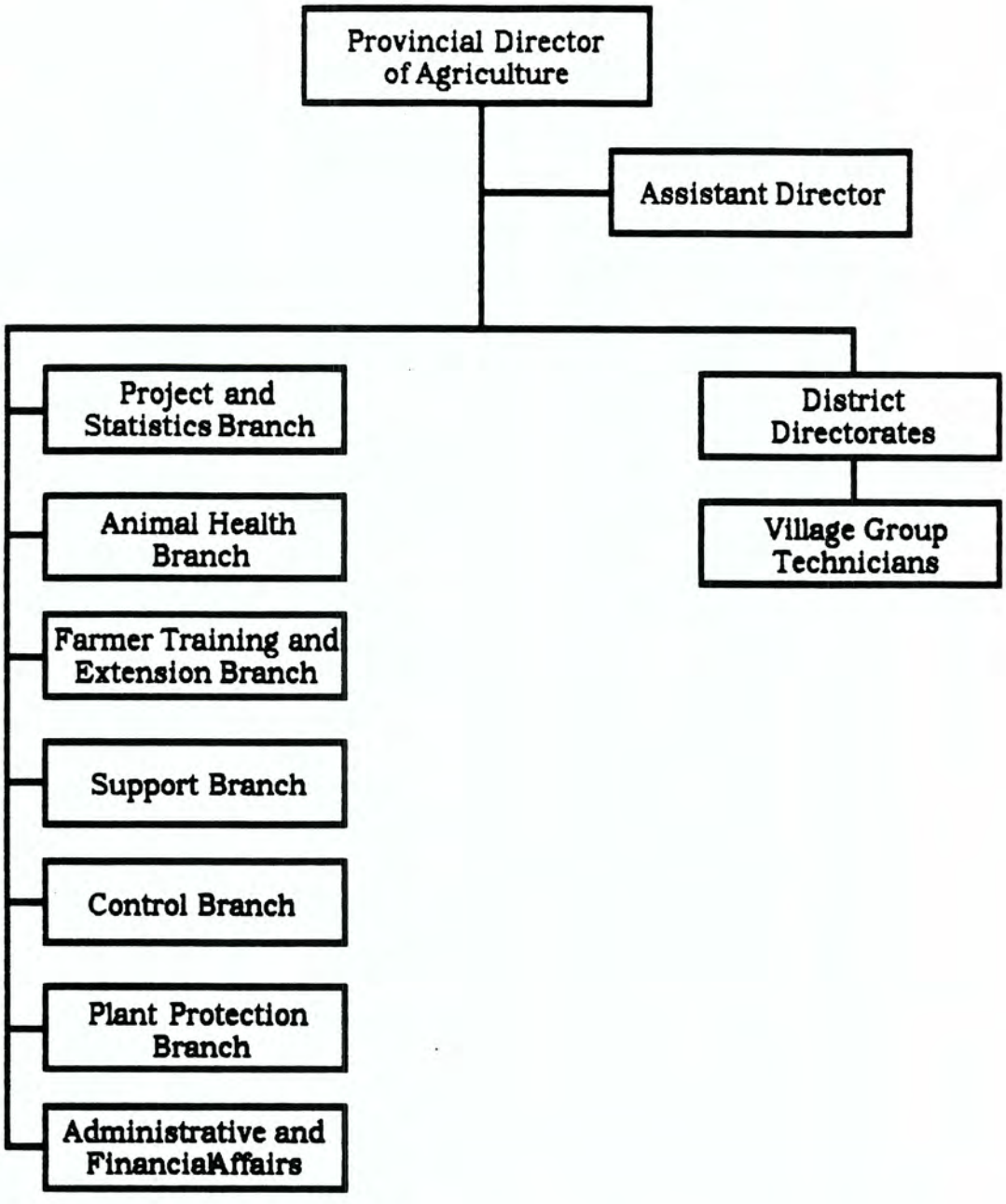

Figure 2.2: Administrative chart, provincial directorate of agriculture (Ministry of Agriculture)

preparing overall budget to submit to the ministry.

- District Directors; collecting agricultural data within the district, preparing, implementing and evaluating extension programs and projects for the purpose of increasing the standard of living for farmers, preparing and proposing the annual budget.

- Village Group Technicians; collecting data, preparing and implementing extension programs, monitoring plant and animal disease, and informing Plant Protection and Animal Health branches if they occur (Figure 1.2).

Farming Community

The population of Turkey is 52,100,000. Forty-eight percent (48%) of the population is rural. There are 3.6 million farm families living in the country's 35,000 villages (Demir, 1987).

Beeley (1987) noted,

> Turkish villages have become less distinctive, less 'traditional.' All-weather roads link new buildings, schools, shops, mosques, solidly built homes, coffee houses, police posts and credit offices. Trucks, mini-buses, even private cars now attract little attention in many areas.

Moreover, most of the Turkish villages have electricity, and a considerable portion of families have access to items such as television and refrigerators.

The national literacy rate was 85.9 for men and 62.5 for women (World Book, 1989). Turkish women have been enjoying the right of election and being elected since 1935.

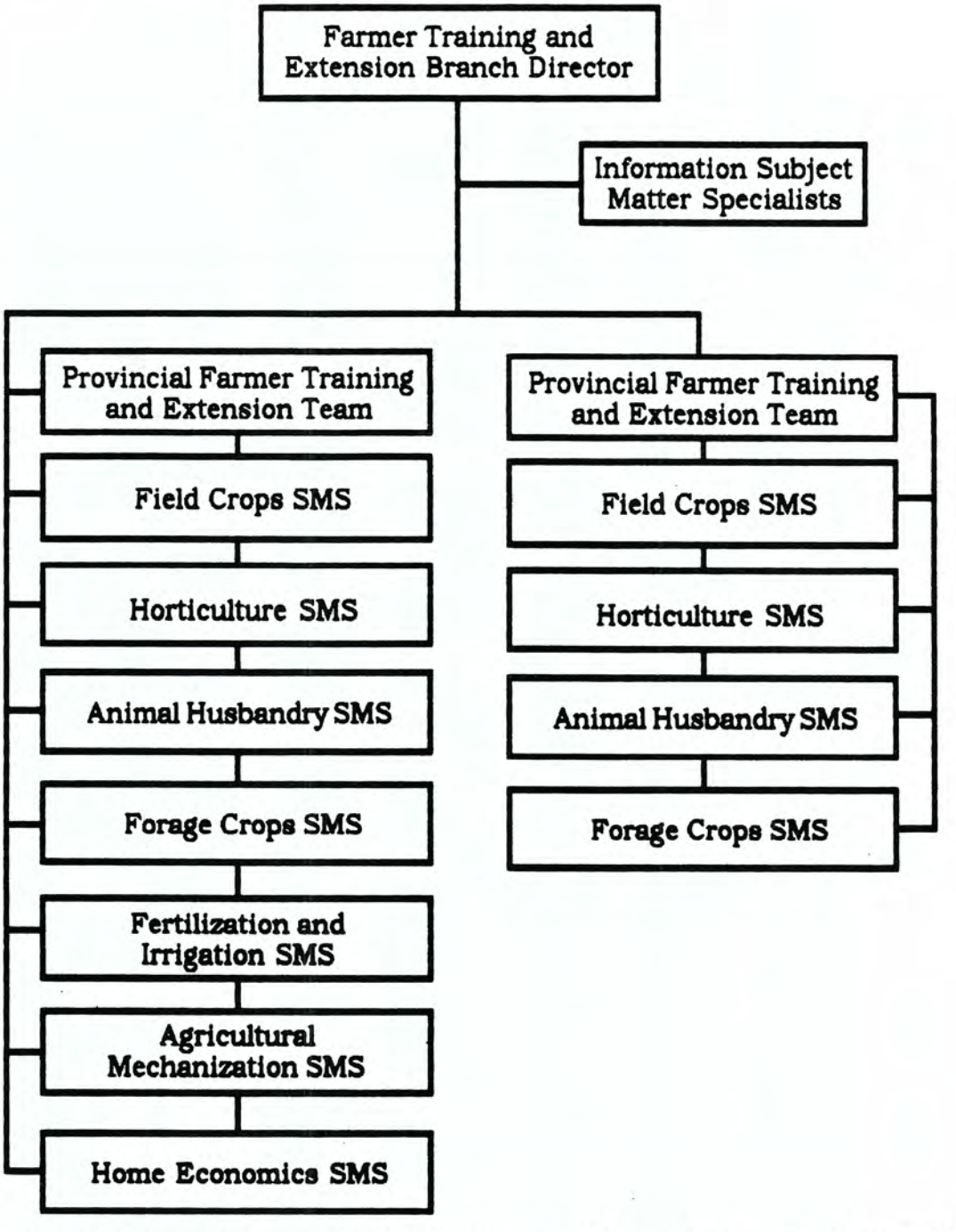

Figure 2.3: Structural organization of farmer training and extension branch directorate in the 16 test cities

Table 2.1: Land Distribution and Farm Size in Turkey

Farmsize (hectares)	Number of Farms 1980
<1	366
1-5	1,467
5-10	686
10-20	388
>20	204

Land Distribution and Farm Size In Turkey, when a farmer dies, his land is divided among his surviving children. Because of a very high population growth rate and the inheritance system, approximately 50 of the farms are smaller than 5 hectares (MAFRA, 1987a).

The above data does not reflect the actual farmsize because sharecropping and renting provide small farmers with access to land to enlarge their operations; also, small farmers' land may be rented by other farmers. So, rural people who have small farms usually have shifted to another business or moved to urban areas. Therefore, as Rolling (1988) stated,

> The proportion of very small farms has decreased considerably, while the proportion of larger farms has increased.

The 442nd village law makes the village council the basic unit of administration and includes the entire adult population. The council elects the headman (muhtar). The village teacher and priest (imam) sit as ex-officio members of the counsel (Ashford, 1974).

One typically finds on the Anatolian plateau a rather tightly knit village community, within which all types of farming take place. This situation seems to have

important policy and planning implications, in regard to the introduction of significant changes in the farming system. Aresvik (1975) further concluded that farmers in Turkey are strong, hard working people who are anxious to improve their lot and are not against innovation; however, the small, marginal farmers have limited resources for taking risks. It is therefore important to adopt packages of improved high yielding technology that carry a small risk in relation to expected benefits.

Community interaction is very important to decision-making for individual farmers. For example, what crops to raise, when to plant, how to plant, etc., are decisions determined by community interactions. These kinds of interactions usually take place in the coffee house or guest-room of the village.

According to Kolars (1974), in Turkish villages the community has traditionally represented the individual. Cooperatives formed for various purposes such as agricultural credit and agricultural marketing cooperatives represent the individual to the community and subsequently the community to the outside world.

T & V Linkages Among Subsystems

There is an agricultural extension information center at the ministerial level, which collects agricultural information from available sources, both international and national, and disseminates this information to the field extension services. At the same time, this extension information center produces periodical publications, books, brochures, technical bulletins, films, slides, etc. Information coordinators at the research institutes and information subject matter specialists in provinces assist the extension information center in performing these activities. Subject matter specialists, at both the province and the district level, attend monthly meetings held at the

research institutions in order to exchange information. In these meetings, subject matter specialists bring farmers' problems to researchers to find out the solution of these problems. Also, subject matter specialists are informed of new research findings (MAFRA, 1987b).

The research institutions make up teams which usually consist of one project coordinator who heads the team, one social scientist, and an agronomist. This team cooperates with extension staff in provinces to carry out on-farm trials. Contact farmers are also involved in these trials (MAFRA, 1987b).

At the village level, VEW's have an important role within the T&V system by linking the extension subsystem to the farmer subsystem. VEW's and subject matter specialists have a meeting once every 15 days for information exchange. In these meetings the problems of farmers are communicated to subject matter specialists by VEW's. Subject matter specialists either give the solutions to these problems at the meeting or, if they are not familiar with the problem, they obtain the information from the researchers before the next meeting. If the researchers also do not have the necessary information, new research is started about the problem (MAFRA, 1987b).

Diffusion and Adoption of Innovations

Colle (1989) indicated that the most influential concept associated with extension and the linking of researchers and farmers is that of diffusion and adoption. To date, more than several thousand studies about the diffusion and adoption of innovation have been completed; nearly half of the studies have dealt with adoption and diffusion of agricultural innovation.

Prior to 1960, attention was directed mostly to the process of the introduction

of new technology at the farm level. More recently, researchers have paid attention to identifying the consequences of the adoption of technology rather than just concentrating on the process of diffusion and adoption.

According to Brown (1981), the classical diffusion model concentrates on the demand side of diffusion to find out how and why individuals adopt, or don't adopt, a particular innovation. On the other hand, the marketing infrastructure perspective in the diffusion area concentrates on the supply side of diffusion, paying attention to the diffusion agency rather than the adopter. Thus the location of the change agencies and the temporal sequencing of their services affects where and when the innovation will be available to clients.

Freimuth (1987, p. 217) noted,

> Most of the previous research on diffusion has assumed a centralized focus; that is, the information originates from some expert source and is diffused as a uniform package to potential adopters who accept or reject it.... Recently, the classical diffusion model has been heavily criticized for this centralized focus and more attention has been given to decentralized diffusion.

According to Freimuth (1987, p. 233), decentralized diffusion systems have the following advantages:

- The information that decentralized diffusion systems develope is likely to be quite compatible with users' needs and problems. Users feel more of a sense of control over decentralized diffusion systems. They make their own decisions about which problems have priority, what information might best solve those

problems, how to seek information and from what sources, and how to modify and adopt information to meet their own needs. Great differences between change agents and clients no longer exist. Decentralized diffusion systems are usually more cost-effective. Such systems encourage user self-reliance and are generally quite popular with users. In spite of these advantages;

- decentralized diffusion system may bring about duplication of effort and ignorance of available resources.
- If a national government wants an innovation diffused that the people do not feel they need, a decentralized diffusion system will prevent its dissemination.

For the purpose of understanding the adoption of high yielding varieties and improved wheat technologies in the Ankara province, the classical adoption of diffusion model will be presented. The model will be used to guide the study of the dissemination of wheat technology and as a check to see if the results of this study will be similar to previous diffusion and adoption studies.

Brown (1981) pointed out that in spite of the criticism that has been directed at the classical model of adoption, it is still one of the most successful of all social science paradigms. The main characteristic of this model is that an innovation is communicated through certain channels over a period of time to the members of a social system (Rogers, 1983).

The acceptance of new ideas goes through several stages before the decision is made to adopt an innovation. Research has indicated that the diffusion process consists of five stages (Blackburn, 1984; Lionberger & Gwin, 1982):

Awareness individual knows of a new idea, but lacks necessary information.

Interest individual seeks information.

Evaluation individual make mental application followed by decision to try or not.

Trial individual tries practice on a small scale.

Adoption if successful, the individual incorporates the practice into his/her operation.

Research has indicated that mass media makes the greatest impact in the awareness and interest stages. To be effective in this process, change agents must know what techniques to use at each stage and how to mobilize them effectively.

Moreover, the change agent must consider several characteristics of the innovation to be promoted:

Complexity The less complex, the greater the chance of adoption.

Divisibility Can the new technology be tried on a small scale?

Visibility Can the result be easily observed? Greater visibility leads to greater adoption.

Compatibility Is the innovation compatible with existing values and practices which are to be maintained?

Relative advantage Are the advantages of the new technology adequately superior to warrant replacing the existing with the new?

Accessibility Does the clientele have adequate opportunity to try the innovation?

Rogers (1983) modifies the classical model; he argues that no one passes through trial stage, therefore, he ignores the trial stage and replaces the adoption stages with implementation and confirmation stages. The implementation stage occurs when an individual puts an innovation into use, and the potential adopter still has some questions about the innovation; therefore, during the implementation stage, the potential adopters seeks additional information until the new idea becomes institutionalized.

Confirmation occurs when an individual seeks reinforcement of an innovation decision already made, but he or she may reverse previous decisions if exposed to conflicting messages about the innovation.

During the adoption process, an individual needs several years to pass from the awareness stage to the adoption stage. All individuals in a social system do not adopt an innovation at the same time; first only a few adopt, then, a large number of people try it, and finally, the remainder accept the new idea (Blackburn, 1984).

Rogers (1983) explained innovations as "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of the system."

According to researchers, recording cumulatively the number of farmers in an area who have adopted an innovation over a period of time gives an adoption curve; it usually has the shape of a normal curve.

Lionberger and Gwin (1982) pointed out that the adoption curve will likely have three distinguishable parts.

1. The first part, when adoption occurs very slowly, but at a slightly increasing rate.

2. The second part, which is characterized by adoption at an increasing rate.

3. A third part, when adoptions occur at a decreasing rate.

These characteristics of the diffusion curve permit distributing farmers into adopter categories.

Rogers (1983) differentiated five adopter categories:

1. Innovators
2. Early adopters
3. Early majority
4. Late majority
5. Laggard

Innovators These individuals have more favorable attitudes toward science than do individuals in other categories. They represent two or three percent of a normal population. They tend to have larger farms than the average person. They have the psychological and financial ability to take a risk. They are usually not past middle age, alert and actively seeking new ideas about farming. They have a close relationship with agricultural researchers and extensionists.

Early adopters Early adopters are the next ten to fifteen percent to adopt. They are a more integrated part of the social system than innovators. They are respected by their peers and they are the embodiment of the successful use of new ideas. They serve as role models and are often viewed as the people to check with before using new ideas. For these reasons, they are very important in diffusing new knowledge in the social system.

Early majority The early majority are those who represent the approximate third of the population who adopt just before the average member. They are very important in linking the adoption process between the early adopter and the early majority.

Late majority These individuals represent the third of the population who just adopt an innovation after the average member in the social system. They might be described as "skeptical", adopting because of economic necessity.

Laggard These individuals are the last fifteen percent to adopt. Their traditional orientations are one of the main drawbacks in adopting new ideas. They are the most isolated of all adopters in the social system.

The adoption level of transferred technology provides evaluators useful knowledge, such as what percentage of clientele adopt or not adopt, and what is the reason for the non-adoption. The adoption level of innovation is one of the useful indicators for monitoring and evaluation of extension efforts.

Monitoring and Evaluation of Extension System

A number of definitions of evaluation can be found in the literature. According to Blackburn (1984), the definitions reflect the approach to evaluation taken by the author. At a general level, it can be said that evaluation is the process of deciding the value of something. Boyle (1981) says evaluation is a continuous process involving the formation of program objectives, gathering evidence to determine to what extent the objectives have been met, and making judgements about the worth of a program based upon the gathered evidence.

Stufflebeam (1983) explained that the "CIPP model of evaluation is based on the view that the most important purpose of evaluation is not to prove but improve." Evaluation is a process of providing useful information for decision-making at four stages, the context, input, process and product. His approach is focused on the process rather than the product.

Stufflebeam (1983) identified the following activities of evaluation:

1. Focusing the evaluation
2. Collecting information
3. Organizing information
4. Analyzing information
5. Reporting information
6. Administering the evaluation

Most of the evaluation of extension projects has focused on product. Murphy and Marchant (1988) stated that the traditional justification for agricultural extension services is that improved practices will lead to higher yields and hence to overall increases in agricultural production and farm income. They further stated that a number of the most ambitious monitoring and evaluation efforts of the late 1970s and early 1980s followed just such an approach, but with inconclusive results.

According to Murphy and Marchant (1988), earlier evaluation efforts failed because of the following factors:

1. They failed to understand and take into account the motivation behind farmers' decision-making processes.

2. They attempted to show a casual relationship between extension services and yields that was analytically impossible to establish.

3. They failed to appreciate the practical difficulties of data collection.

For the above reasons, they concluded that adoption rates are now the preferred monitoring indicators because they provide immediate feedback directly linked to the program's performance.

Cernea and Tepping (1977) noted monitoring and evaluation are closely related; monitoring (keeping track of project activities and progress) provides current information for project management and also a basis for ongoing ex-post evaluation (assessment of project impact and overall results).

Extension evaluation is the assessment of the overall affects of the agricultural extension and research program on production levels and on the farmers' welfare, and to determine the degree to which the project is reaching its economic, technical and social targets set for a given period of time. Often subjective measures are used to assess the degree of farmers' acceptance of the recommended practices, as well as their actual effectiveness in the fields. Cernea and Tepping (1977) noted that yield, on the other hand, can be measured quite objectively and can be included as a principal measure of the impact of the extension program; although certainly not, the only measure.

Cernea and Tepping (1977) listed the following indicators for monitoring and evaluation:

List of Indicators for Monitoring

	Objective: Indicator	Information Sources
1)	Staffing of Extension Organization	–Reporting
2)	Selection of Contact Farmers	–Ad hoc study and reporting
3)	Training (role learning)	–Reporting
4)	Physical Equipment	–Reporting and Accounting
	Objective: Extension Performance	
1)	Degree of Exposure to Extension –Farmers reached directly –Farmers reached indirectly	Monitoring sample survey
2)	Quality of Visits	Monitoring sample survey
3)	Farmers' evaluation of T&V	Monitoring and harvest survey Village studies
4)	Adoption of farm practices	Monitoring sample survey Harvest study Village studies Farm practices ad hoc study
5)	Role Behavior (VEW's, AEO's)	Ad hoc studies Monitoring survey
6)	Training (quality)	Ad hoc study

List of Indicators for Evaluation

	Indicators	Data Sources
1)	Yields of major crops	Harvest survey
2)	Cropping intensity and patterns (changes)	Harvest survey
3)	Area under high yielding varieties	Reporting
4)	Spread of key practices	Monitoring and harvest surveys Village studies
5)	Amount of purchased inputs (fertilizers, pesticides)	Aggregate statistical information from distributing agencies
6)	Credit use/recovery	Cooperative/bank statistics

According to Binnendijk (1989), some of the most serious problems that evaluators have had with monitoring and evaluation of development projects have been:

High costs Formal impact evaluation designs based on quasi-experimental models

and rigorous multiround surveys have been very costly, often costing hundreds of thousands of dollars or even millions of dollars to complete.

Dependence on specialized skills This approach required rigorous statistical and data collection skills beyond the capabilities of indigenous and even donor staff. Reliance on external "experts" often resulted in evaluation issues and findings being oriented away from management needs.

Lengthiness Evaluations required a long time frame to complete, frequently taking several years (often beyond the funding life span of the project) before evaluation results were available. Because of this, they were of little practical use to the project manager concerned with improving implementation and were also hard to fund and complete within the context of a project. For these reasons, many of these efforts were never completed.

Methodological weaknesses There were inherent methodological weaknesses in attempting to apply experimental design standards to real-life development project situations in which random assignment of treatments (e.g., project services) is typically infeasible and the alternative quasi-experimental design of carefully matching groups based on important characteristics is difficult to the point of being impractical. Further more, extraneous factors are constantly impinging on the project setting and differentially influencing the experimental and control groups. Because of difficulties such as these, the findings of some of these studies were inconclusive in terms of proving impacts and attribution, despite large expenditures on surveys.

Missed management concerns The findings of such evaluation designs (whether

developmental impacts were statistically attributable to a project intervention) frequently missed many of management's concerns regarding factors responsible for project success or failure. The design frequently treated these operational concerns (why and how processes occurred) as a "black box." Thus while the results were perhaps useful for "accountability" purposes (e.g., the donor agency could give examples of "successful" projects with proven impacts), there was little of operational value in the evaluation findings regarding lessons for improving project performance or for the future design of similar projects.

Overemphasis on quantification An evaluation design with an emphasis upon quantification of outcomes could not be easily applied for certain types of project goals, such as those emphasizing institution building or encouraging community participation as objectives. Also, a qualitative design tended to result in too much emphasis on easily measured impacts and to ignore unanticipated and difficult to measure outcomes.

Narrow scope The design approach frequently ignored other important evaluation issues, such as continued relevance of objectives, measuring intermediate effects, cost effectiveness, and sustainability issues in its concentration on measuring impacts, narrowly defined.

Not generalizable The findings of such studies were not transferable beyond their particular contexts. In other words, because a particular type of project had a proven impact in one geographical setting, it could not be concluded that similar projects would be successful in other countries or even in other locations within the same country. Lessons from the past experiences were leading evaluators

to new monitoring and evaluation initiatives and reorientations by the 1980s. Following are some of the typical evaluation issues that are currently being addressed by the donors (Binnendijk, 1989).

Relevance The continued relevance of the project's objectives and approach may be assessed, in light of changing development problems and changing policies and priorities of the donor and host country.

Effectiveness Evaluations of project effectiveness usually examine whether the project's services, technical packages, or other products are actually being used by the intended target group; whether there is equity or bias in access; and whether coverage of the target group is as planned in the project design.

Impact Some evaluations gather evidence regarding accomplishment of the ultimate development impact goal of a project, for example, whether the beneficiary group's socioeconomic status or welfare has improved as a result of the project. Unintended as well as intended impacts may be studied, as may any differential impacts among subgroups. While traditionally such evaluations were done ex post of project completion, donors have been increasingly seeking ways to assess initial impacts during project implementation, using intermediate "proxy" indicators of results and also more qualitative, process-oriented evaluation approaches emphasizing beneficiary feedback.

Efficiency Evaluations that examine the results of a project in relation to its costs are concerned with efficiency. Cost-benefit analyses of economic investment projects are typically done by the multilateral banks and to a lesser extent by the bilateral donors. Cost-effectiveness analyses are more frequently being

done for projects with social objectives, whereby the costs of achieving the same social objective by alternative project approaches can be compared. However, these cost-effectiveness analyses are still relatively difficult to do (they require a quantification of the social benefits of a project as well as costs) and are therefore rare. More intermediate indicators, such as cost per unit of output or cost per beneficiary reached, are more typically used as proxy measures of efficiency.

Sustainability There has been a growing concern among the donor community about the financial and institutional sustainability of a project's services and benefits after the donor's involvement ends. More valuations are being undertaken several years after donors have completed projects to investigate their sustainability.

Special performance issues Evaluations are also increasingly addressing special concerns such as the impacts of the project of the environment, on women, or on the development of the private sector.

Factors influencing performance For evaluations to be operationally most useful, the factors that influenced a project's successful or unsuccessful performance should be identified. These factors may include aspects internal to the project and thus more within the control of project management, such as organizational and management approaches, the distribution system, the appropriateness of the technology or services being promoted, the extent of community participation, and so on (Binnendijk, 1989).

Binnendijk pointed out that the 1980s saw a growing experimentation with mul-

tiple data collection approaches. The concept of one standard or "blueprint" methodology was replaced by a philosophy of using multiple data collection techniques and sources to address a variety of management-oriented questions. Sample surveys were replaced or accompanied by less representative low cost, rapid reconnaissance for gathering information about projects and their beneficiaries. These approaches include:

Administrative records Simple, yet carefully designed, records systems can be used to regularly assess project progress and costs compared to design plans, targets, and schedules. They can also be very useful for keeping basic information on acceptors of project services such as their socioeconomic status, whether they become "repeat" users, their repayment profile, and other pertinent information.

Small sample surveys Inexpensive "mini" surveys with samples as small as 100 respondents can be used to measure the proportion of a population with access to project services, those adopting or not adopting the services, and their initial responses and perceptions.

Proxy indicators Rather than attempting directly to measure changes in project outcomes, sometimes more intermediate, or proxy, indicators provide sufficient information on results at lower cost. For example, proxies for agricultural production might include changes in the volume of commodities passing through markets, estimates of commodity supplies from traders or other key informants, and watching movements in prices as an indicator of supply movements.

In-depth beneficiary information Project experience has shown again and again

that failures are often due to not understanding the perceptions and the local context of the intended beneficiaries. Informal methods, such as use of key informants, holding focus group meetings or village meetings, and observing participants as "case studies," can be inexpensive and rapid feed-back approaches to gaining useful information for management's operational decisions. These methods emphasize understanding why and how the project implementation process is influencing beneficiary access, adoption, and response to project services. It is not overly concerned with measuring quantities. Thus statistical representativeness is not critical, and in-depth interviews with thirty to fifty beneficiaries may be plenty to draw valid conclusions for management actions.

Summary

The literature reviewed in this chapter provides a background for understanding the role of the agricultural information system in agricultural development. An effective agricultural information system requires linkages, not only among the sub-systems, but also within each of the sub-systems. The system approach suggested by Havelock (1971), Nagel (1980), Lionberger and Gwin (1982), and Rolling (1988), generates, transforms, transfers, consolidates and feeds back agricultural information to increase knowledge and technological capacities of the clientele.

The review of the literature regarding the extension system in the United States, other countries and Turkey helps to explain the nature of the successful implementation of extension in the United States and problems faced by the developing countries with the implementation of the extension system.

The literature review indicated that the largest project supported by the World

Bank was the T&V system which was first developed and tested by Daniel Benor in Turkey in 1967 (Benor & Harrison, 1977). The main characteristic of the T&V system is to establish a two-way flow of information between farmers, extension and research and to deliver selected timely and relevant technology to farmers, especially small-scale farmers.

Research to assess the impact of the T&V systems was conducted by several researchers. For example, Feder, Slade and Sundaram (1985), conducted several studies in India to assess the impact of the T&V system on the adoption of recommended practices, cropping patterns and yields. It was found that T&V system was more successful in terms of delivering information, and transferring technology to farmers than the traditional extension system. Demirtaş (1988), in his study related to the agricultural information system in Turkey, concluded that the T&V system focuses change effort on individual farmers using contact farmers as the point of contact in the diffusion of innovation. Since basic decisions in a Turkish community require community interactions, the T&V system cannot be effective in introducing these changes. Aresvik (1975) also argued that in Turkey, one has to work with the village as a unit, not with the individual farms for the purpose of introducing new technology. Rolling (1988) in his research, concluded that the T&V system cannot be successful just focusing on extension, without considering research.

Adoption and diffusion of innovations and monitoring and evaluation of extension efforts was also included in the literature review (Rogers, 1983). Research has indicated that the diffusion process consists of five stages; awareness, interest, evaluation, trial, and adoption. To be effective in this process, extension agents must know what techniques to use at each stage and how to mobilize receivers effectively.

Moreover, several characteristics of the innovation must be considered by the extension agency; the promoted innovation should be less complex, triable on a small scale, observable, competitive, have a relative advantage and be accessible to the clientele.

Researchers indicated (Binnendijk, 1989; Murphy & Marchant, 1988) that evaluation of the extension effort, both product and process, was essential to establish an effective extension system. Assessing the adoption level of recommended practices would indicate to what extent agricultural extension and research program have affected clientele and what needs to be changed or adjusted to eliminate the existing problems, to increase the quality of services, and to accomplish the objectives of the extension programs. A lack of monitoring and evaluation was one of the main drawbacks for implementing a successful extension system in most developing countries.

CHAPTER 3. METHODS AND PROCEDURES OF RESEARCH

The main goal of the study is to assess the impact of the Training and Visit system regarding wheat technology by farmers in Ankara province, Turkey. The secondary purpose of the study is to compare practices being used by farmers in Ankara province with improved practices recommended by the field Crop Research Center, to determine the adoption level of recommended practices in wheat production.

Since the agricultural information system consists of three main components; Research, Extension and utilizers, the target population of the study should therefore include farmers, extensionists and researchers. To investigate the T&V system, it was decided to obtain information from each subsystem to make reliable, valuable judgements about the whole system. Bryant and White (1986) stated that the point of using multiple data sources was that all of the relevant interest groups would not have the same point of view on a project; thus it was important to include as many as feasible in reflecting the appropriate criteria for determining whether or not a project had accomplished its goals.

Donald (1983) noted that there were six main reasons for bringing two or more data sources in the same study:

- Obtaining categories of information
- Improved accuracy in measuring single phenomenon

- Qualitative depth
- Generalizability of findings across units
- Historical interpretation
- Testing of association

The most obvious advantage of multiple data sources is that one approach can provide information that are not covered at all or are covered very lightly by others.

The content of this chapter is about the research procedures followed in conducting this study. The procedures are divided into five sections: 1) Research design, 2) Population and sample, 3) Instrumentation, 4) Data collection, and 5) Data analysis.

Research Design

This study was conducted by using the descriptive survey method. Descriptive research studies are designed to obtain information concerning the current states of phenomena (Ary and Razavieh, 1985).

The study involved a number of elements which are characteristic of multiple evaluation research methods. Melvin and Shotland (1987) indicated that the primary benefit of multiple methods are not only those that we associate with such terms as convergence and triangulation, that is, the more accurate specification of some estimate, but also that multiple methods may usefully address different but complementary questions and by doing so, increase the interpretability of our results. A second potential benefit of using multiple methods is the reduction of inappropriate certainty.

By considering the characteristics of the target population, quantitative closed-ended questions were used to obtain data from the farmers.

Quantitative closed-ended questions and qualitative open-ended questions were both used to gather information from the extensionists and qualitative open-ended questions were used to get information from the researchers. Research results from production practices research were also used in this study.

Population and Sample

This study dealt with three different target populations in Ankara province. The first population consisted of eighty-four randomly selected farmers, four from each of the twenty-one villages in seven districts. Five farmers did not want to participate in the study, and five questionnaires were incomplete. Out of the total, 88% (seventy-four) questionnaires were considered valid.

The second group consisted of fifteen village extension workers. Eleven of them participated in the study.

The third group consisted of four researchers, all of whom participated in the study.

Instrumentation

An eight page questionnaire was developed by the researcher to obtain data from farmers included in the sample, village extension workers, and the researchers.

In order to obtain validity, clarity, and conciseness of the instrument, reviews were conducted. The reviews of the instrument were done by the following groups:

1. Faculty members at Iowa State University.
2. One graduate student in the Department of Agronomy at Iowa State University.
3. Four graduate students in the Department of Agricultural Education at Iowa State University.
4. Five Turkish graduate students from different departments at Iowa State University.
5. The former national wheat research coordinator in Ankara, Turkey.

By considering their suggestions, the questionnaire which consisted of five parts was developed:

Part I of the instrument was used to obtain data on the names of the wheat varieties grown, farmers' perception of the extension service, source of information used by the farmers, and farmers' problems related to wheat production. A 1-7 point response scale was used with one being low and seven being high.

Part II of the instrument was used to collect information on wheat production practices used by farmers.

Part III of the instrument was used to collect information on the demographic characteristics of the farmers.

Part IV of the instrument was used to gather data from the village extension workers using both open-ended and closed-ended questions.

Part V of the instrument, which consisted of open-ended questions, was used to obtain information from the researchers.

Data Gathering Techniques

The personal interview technique was used to collect data. This data gathering technique was considered to be an effective way of collecting information, especially from poorly educated farmers.

Initially, the research was proposed to Farmer Training and Extension Services in Ankara, and the request was made to carry out the data collection procedure (Appendix A). Research was approved by the extension agency (Appendix A), and the questionnaires were mailed out to headquarters of the Ankara province Farmer Training and Extension Service agency on February 12, 1990, with a cover letter explaining the purpose of the study (Appendix B).

Extension specialists from the farmer training and extension services' staff with the collaboration of district extension staff collected the data on behalf of the researcher through personal interviews with farmers, village extension workers and researchers between February 26, 1990, and March 13, 1990.

Village extension workers were interviewed in their offices. Farmers were interviewed in a public place (such as a coffee-house), a head-man office, or their homes.

Analysis of Data

In this study, both content analysis and statistical analysis were implemented. Content analyses were used to interpret qualitative data; descriptive statistical procedures were used to analyze the quantitative data, utilizing the Statistical Package Program (SAS). Raw data responses to adoption level of recommended wheat practices were coded according to their variance from the recommended practices. The

values given to the responses are shown in Table 3.1.

The following subprogram and procedures were used in conducting statistical analyses:

1. The subprogram FREQUENCIES was used to analyze means, standard deviations, frequencies and percentages.

2. The analysis of variance subprogram NPAR1WAY was used to test the differences among the farmers' familiarity with the Agricultural Applied Research and Extension Project when farmers were grouped by age, occupation, education, and farm size.

3. The paired t-test was used to determine the perception of Ankara farmers about the quality of services from the local extension organization before and after the implementation of the Agricultural Applied Research and Extension project.

4. The subprogram PROC GLM was used to test for significant differences among farmers' wheat yields when grouped by adoption level of recommended wheat practices. The Scheffe' test was performed to locate the sources of differences if a 0.05 significance or less was found.

Table 3.1: Values for farmers' actual practices and their variance from the recommended practices (N=74)

Time	On time	Late	Early
First tillage	1	2	3
Second tillage	1	2	3
Third tillage	1	2	3
Equipment	**Recommended**	**Nonrecommended**	**No tillage**
First tillage	1	2	0
Second tillage	1	2	0
Third tillage	1	2	0
Depth	**Recommended**	**Exceeding Recommended**	**Less than Recommended**
First tillage	1	2	3
Second tillage	1	2	3
Third tillage	1	2	3
Seeding			
	Recommended	**Late**	**Early**
Time	1	2	3
	Recommended	**Nonrecommended**	
Equipment	1	2	
	Recommended	**More than Recommended**	**Less than Recommended**
Seed rate	1	2	3
	Recommended	**Exceeding Recommended**	**Less than Recommended**
Depth	1	2	3

Table 3.1 (Continued)

Fertilizer–Nitrogen			
	Recommended	Late	Early
Time	1	2	3
	Recommended	More than Recommended	Less than Recommended
Rate	1	2	3
Fertilizer–Phosphorous			
	Recommended	Late	Early
Time	1	2	3
	Recommended	More than Recommended	Less than Recommended
Rate	1	2	3
Weeding (using chemical killing)			
	Practices Implemented	Practices Not Implemented	
	1	0	

CHAPTER 4. FINDINGS AND DISCUSSION

The primary purpose of this study was to assess the impact of the Training and Visit System on wheat technology by farmers in Ankara, Turkey.

In this chapter, the findings of the survey will be discussed as they correspond to the specific objectives of the study, which were:

1. To identify demographic characteristics of farmers in selected villages of Ankara Province.

2. To identify perceptions of the Training and Visit System (T&V) by farmers, Village Extension Workers (VEWs) and researchers.

3. To determine farmers' level of adoption of recommended wheat production practices.

Demographic Information of the Farmers

Through a series of questions in part three of the questionnaire, data related to personal characteristics was gathered in order to provide an understanding of the background of the respondents.

Respondents were grouped by districts in Ankara Province as reported in Table 4.1.

Table 4.1: Distribution of respondent by district

Districts	Frequency of Respondent	Percent (%)
Gölbaşi	16	21.6
Bâlâ	8	10.8
Nallihan	8	10.8
Sincan	10	13.5
Koçhisar	8	10.8
Kalecik	10	13.5
Beypazari	14	18.9
Total	74	100.00

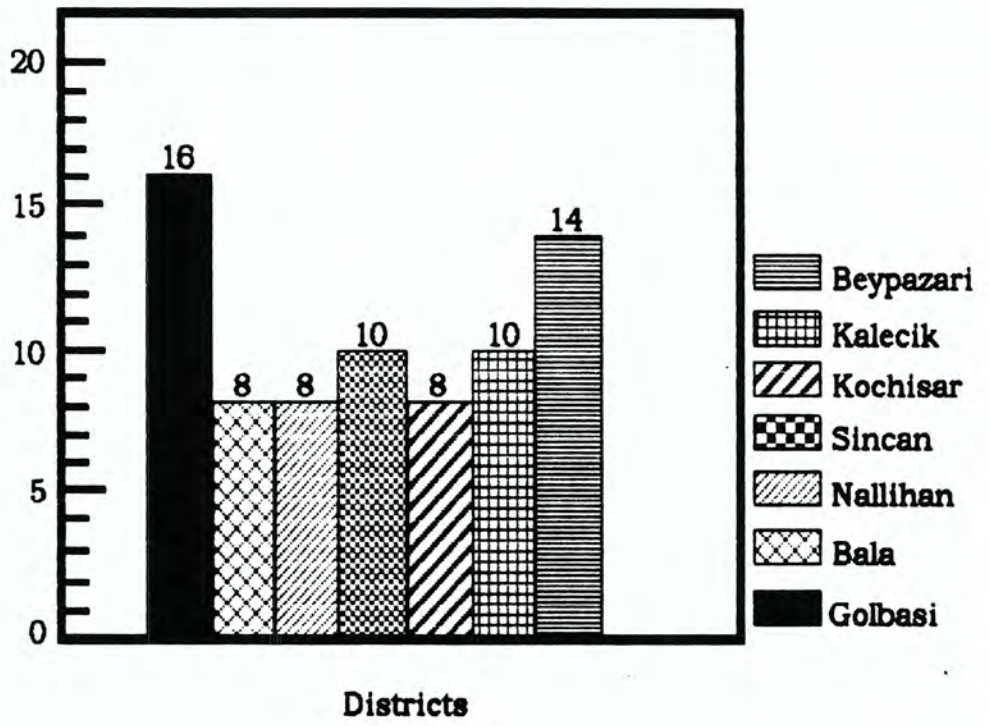

Figure 4.1: Frequency distribution of respondents by district

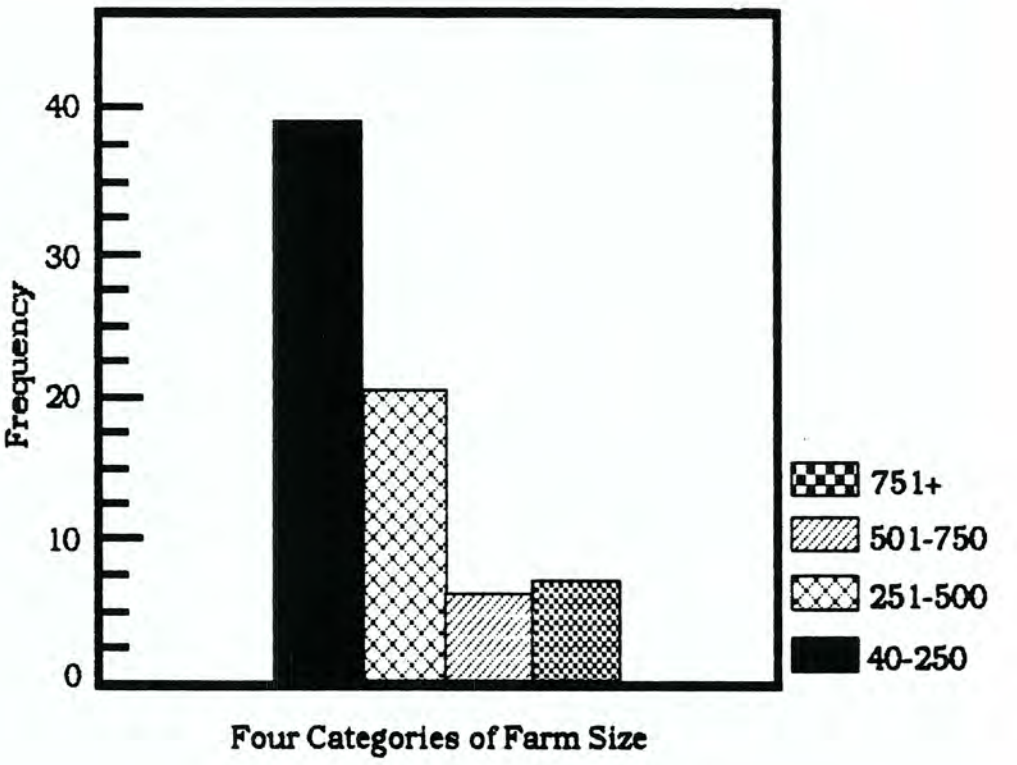

Figure 4.2: Farm size in decares

Randomly selected districts in Ankara are located in different parts of Ankara province. Beypazari and Sincan are located in the west part, Kalecik in the northeast, Golbaşi is located in the south, Bälä and Koçhisar are located in the south and southeastern part of Ankara province.

The size of the farms varied from 40 decares to 2000 decares, with an average of 383.5 decares. For the purpose of presentation, farm size was been divided into four categories, shown in Table 4.2.

Fifteen farmers (20.4 percent) had farms of over 500 decares and were generally considered as having commercially viable operations. Twenty farmers had medium-sized farms, also considered profitable. The rest of the farmers (39) had a small

Table 4.2: Distribution of farms by farm size (N=74) (Decare is 1,000 square meters)

Farm size in decares	Frequency	Percent (%)
40–250	39	52.5
251–500	20	27.1
501–750	7	9.6
751–more	8	10.8

amount of land. Most of them were not commercialized and they were dealing with agriculture for their consumption.

All of the respondents (74) indicated that they owned the farms that they operated. In addition to farmers' own farms, 32 farmers (43.2 percent) rented land from other land owners on a share basis and 17 farmers (23 percent) also rented on a cash-basis.

By considering total owned land (28,380 decares), the percentages of cash basis and share basis land within the total operated area was 6,310 decares (22 percent) and 3,235 decares (11.4 percent), respectively.

The mean farm size was 383.5 decares, the median 250 and the mode was 500 decares.

Farm size distribution of sampled farms does not seem to represent the land distribution in the nation, but small sized land owners usually contract out their land to other farmers for a year. Therefore, it can be said that sampled farmers in this study can represented the population who actually worked in agriculture.

The educational level of the farmers has been classified into four levels according to the number of years spent in formal schooling. The first level indicates inability of the farmer to read or write and only five farmers (6.8 percent) of the sample were in this category. There were 56 farmers (75.7 percent) in the second category

Table 4.3: Distribution of family size, total household (N=74)

Size of Family	Frequency	Percent (%)
1–4	13	17.6
5–8	44	59.4
8+	17	23.0

indicating those who received a primary certificate (finished 5 years of schooling). The third category contains 8 farmers (10.8 percent) and represents those who received an intermediate certificate (finished 8 years of schooling). The fourth category represents those who received a secondary certificate (finished 11 years of schooling). The fifth category represents those who received a college or university degree, but no farmers were in this category. Therefore, about 93 percent of the respondents were able to read and write, with 17.6 percent attaining at least 8 years of schooling, which indicated that the level of education was not at the desirable level yet.

Sixty-four farmers (86.5 percent) indicated that they were engaged solely in farming including animal husbandry and crop production without having an outside job; 10 farmers (13.5 percent) were engaged in non-farm commercial work as well.

The age of the respondents ranged from 26 years to 66 years old. The average was 47 years, indicating a population that was mature.

The family size ranged from 2 to 13, the mean size of the farm family was 6.7. For the purpose of presentation, family size was grouped by small (1-4), medium(5-8), and large (8+). The percentage in each category is revealed in Table 4.3.

The table shows that the Turkish farm family tends to be quite large (82% falling into the medium and large categories) because not only do the farmer's children live in the household, but also grandparents often are part of the household.

Perceptions of Training and Visit System by Farmers, Village Extension Workers and Researchers

This section describes the perceptions of farmers, VEWs and researchers of the T&V extension system.

Farmers' perceptions of the T&V extension system

Researchers Bryant and White (1986), Navaratnam (1982) and Sigman and Swanson (1984) argued that one of the serious problems observed in most developing countries regarding the implementation of extension projects is the lack of local involvement or local participation during the implementation and evaluation of the extension programs.

First, therefore, farmers were asked to rank their familiarity with extension programs. It was considered that the more they were familiar with extension programs, the more they participated and the more they benefited from the extension agency.

Second, for the purpose of making comparisons, farmers were asked to rank the quality of services received from the extension agency before and after the local implementation of the T&V System.

Above statements were ranked on a seven-point scale where one (1) indicated the minimum and seven (7) the maximum degrees of familiarity with extension projects and quality of services received from the extension services.

Table 4.4 shows the means and the standard deviations for farmers' familiarity with the T&V extension system and quality of services as perceived by them before and after the implementation of the T&V System.

The mean rating on the farmers' familiarity with the T&V extension system was

Table 4.4: Means and standard deviation obtained from farmers regarding their familiarity of project, quality of services received by farmers before and after 1985 (N= 74)

	Mean	SD
Farmers familiarity with project	3.66	1.06
Quality of services received by farmers before the implementation of project	3.70	1.37
Quality of services received by farmers after the implementation of project	4.72	1.07

1 = lowest familiarity, 7 = highest familiarity

observed to be 3.66 with a standard deviation of 1.06. Based on this data, it can be concluded that farmers' familiarity with the extension programs was a little less than the midpoint of 4.0.

The mean rating obtained for the quality of services as perceived by farmers before and after implementation of the T&V System was 3.70 with a standard deviation of 1.37 and 4.72 with a standard deviation of 1.07, respectively.

Third, using a seven-point scale, farmers were asked to rank the importance of information sources in solving problems related to wheat production. The results are shown in Table 4.5. The highest group means were observed for extension personnel and television/radio with the group means of 4.87 and 4.45 respectively. These information sources were rated above the mid point of 4.0. Friends/neighbors, extension publications, newspapers/ magazines and private companies were observed to have the group means of 3.68, 3.31, 3.02, and 1.45, respectively. Extension personnel and television/ radio were perceived as the most important information sources by farmers for help in solving problems with wheat production.

Table 4.5: The importance of information sources as perceived by farmers. (N = 74)

Information Sources	Mean	SD
Extension personnel	4.87	0.92
Extension publications	3.31	1.01
Newspapers/magazines	3.02	1.22
TV/radio	4.45	1.17
Friends/neighbors	3.68	1.25
Private companies	1.45	0.89

1 = lowest familiarity, 7 = highest familiarity

One-way analysis of variance was used to calculate if significant differences existed in the level of familiarity, when Ankara farmers were grouped by selected demographic variables: age, educational level, occupation and farm size.

Table 4.6 shows the analysis of variance of the level of farmers' familiarity with the extension programs when Ankara farmers were grouped by age, educational level and farm size. No significant differences were found, which indicates that, regardless of farmers' age, educational level, occupation and farm size, the responses to the familiarity with extension programs were similar. These results turned out to be as expected. In terms of educational level, farm size and age, there were no significant differences among the farmers' familiarity with extension programs.

In order to test farmers' perceptions on the quality of services perceived by them, before and after the implementation of the T&V extension system, the paired-t test was used.

Table 4.7 presents the outcomes of the paired t-test. It was found that the farmers' perception of the quality of the extension service was significantly higher after the implementation of the T&V System than before (significant at the 0.001

Table 4.6: Analysis of variance of farmers' familiarity with extension programs, when farmers were grouped by age, educational level, occupation and farm size

Demographic Grouping		N	Mean	F-ratio	F-Prob
Age of Farmers					
Group 1	($\leq$ 35)	13	3.77	0.79	0.50
Group 2	(36 to 45)	19	3.89		
Group 3	(46 to 55)	22	3.41		
Group 4	(>56)	20	3.68		
Total		74			
Educational Level of Farmers					
Group 1	illiterate	5	3.60	0.08	0.92
Group 2	5 years schooling	56	3.64		
Group 3	8 years schooling	13	3.77		
Total		74			
ccupation of Farmers					
Group 1 full-time farmers	64	3.73	2.22	0.14	
Group 2 part-time farmers	10	3.20			
Total		74			
Farm Size (decares)					
Group 1	(40-250)	39	3.72	0.38	0.77
Group 2	(251-500)	20	3.75		
Group 3	(501-750)	7	3.43		
Group 4	(751-More)	8	3.38		
Total		74			

1 = lowest familiarity, 7 = highest familiarity

Table 4.7: Paired-comparison t-test regarding quality of services received by farmers before and after the implementation of Training and Visit System (N=74)

Variables	Mean	Difference of Mean	STD Error of Mean	t	Prob.
Quality of services before T&V System	3.70	1.027	0.184	5.57	.0001
Quality of services after T&V System	4.72				

A seven (7) point scale was used (1 = lowest, 7 = highest)

level).

Village Extension Workers perception of the T&V System

This section covers the responses of Village Extension Workers to the following questions:

- The role and responsibility of village extension workers as perceived by them.
- Village extension workers' opinion of the T&V System.

Questions number one and two were asked using qualitative open-ended questions.

The Role and Responsibility of Village Extension Workers as Perceived by Themselves

The main aim of asking this question was to clarify and identify the perception of Village Extension Workers (VEWs) about their roles and responsibilities within the framework of the Training and Visit (T&V) system.

Eleven village extension workers expressed their specific responsibilities and roles. The following was the principal perceived responsibility as stated by each village extension worker:

VEW 1 "To define the problems and needs of farmers, and to meet these needs through service-related agricultural education and extension." Two years experience.

VEW 2 "To teach new techniques, to find out timely solutions for farmers' problems, to increase the number of on-farm demonstrations."Three years experience.

VEW 3 " To teach agriculture-related new techniques to farmers. To identify farmers' problems and help them solve these problems, and to conduct field demonstrations." One year experience.

VEW 4 "To work together with contact and non-contact farmers to carry out on-farm demonstrations and to teach new techniques to farmers." Fifteen years experience.

VEW 5 "To teach improved agricultural techniques, to conduct on-farm demonstrations, to determine farmers' problems and find their solutions." Four years experience.

VEW 6 "To visit contact and non-contact farmers regularly, to talk about agricultural-related subjects with farmers, to conduct on-farm demonstrations." Ten years experience.

VEW 7 "I try to fulfill my responsibilities. We have a lot of responsibilities, but limited authority and resources." Three years experience.

VEW 8 "To improve farmers' knowledge and capacity, to conduct on-farm demonstrations, and to show the results of the demonstrations to farmers." Five years experience

VEW 9 "To transfer new techniques to farmers, in order to increase their agricultural productivity." Five years experience.

VEW 10 "To teach new agricultural techniques, and try to convince farmers to adopt these new techniques." This is besides fulfilling his administrative duties. Three years experience.

VEW 11 "Within the framework of the T&V system, to establish good relationships among farmers, to be interested in their problems, to select contact farmers, and to inform subject matter specialists about the farmers' problems which cannot be solved by us." Three years experience

Two of the VEWs had ten and fifteen years experience, respectively. Two of them had five years experience and the rest (seven) had three or less years experience. The majority of the farmers were much older than the VEWs. This means that establishing good relations with farmers is quite difficult for VEWs. It is too optimistic to expect VEWs with three or fewer years experience to respond to the farmers' problems. Secondly, on-farm demonstrations seemed to be over emphasized by the VEWs. Demonstration is a very essential teaching technique (Blackburn, 1984). However, other teaching techniques such as group meetings, seminars, field

trips, films, etc., are also important teaching methods, and they appear to be not implemented by VEWs.

Further, only one of the extension workers mentioned their responsibilities or relationship in interacting with subject matter specialists and their extension officers. It can be said that there was a lack of communication between subject matter specialists and village extension workers.

Another important aspect of the respondents' perception about their duties was that they did not mention regularly scheduled visits to farmers and fortnightly training sessions given by subject matter specialists and extension officers. However, regularly scheduled visits to farmers and attending fortnightly training sessions are very important roles and responsibilities of VEWs within the T&V system. Also, village extension workers' perceptions about their responsibilities include informing farmers on the price and availability of necessary inputs and market conditions. These responsibilities which were not perceived as a responsibility by VEWs are basic rules of T&V system that VEWs are supposed to carry out (Benor & Baxter, 1984).

Village extension workers' perception of the T&V extension system.

All the village extension workers indicated that with the implementation of the T&V system they have emphasized on-farm demonstrations. According to experienced VEWs, especially successful demonstrations increased the adoption level of recommended practices, and recommended techniques were usually adopted by farmers in a short time compared to the conventional extension system. A majority of the VEWs said that the T&V system gave an opportunity to increase the amount of communication and interaction between farmers, thus improved techniques could be

transferred to farmers in a short time.

Six of the VEWs said that training programs given by researchers increased their theoretical and practical knowledge and they had an opportunity to test them. All the VEWs agreed that the T&V system increased the level of activity of extension efforts.

The eleven village extension workers indicated that most of the farmers lacked financial resources. Thus, the majority of farms could not afford to buy necessary inputs. In addition, sometimes inputs were not available when farmers needed them, even if they had enough financial capacity. According to VEWs, these conditions were one of the main obstacles for non-adoption of recommended practices.

The eleven village extension workers didn't have enough teaching aids to implement different teaching techniques, such as slides, pamphlets, overhead projectors, television and film strips.

A majority of the village extension workers (8) indicated

> We don't have experience and enough technical practical knowledge about all agricultural subjects. When we visit farmers they usually ask us many technical questions not only about wheat, but also different agricultural fields.

Almost all (10) of the village extension workers said they didn't have enough transportation resources (however, they said that after the T&V system, transportation facilities had improved).

Four village extension workers said that a considerable number of farmers dealt with non-agricultural work besides their agricultural work. These farmers could make

more income from the non-agricultural work than from their agricultural incomes. Therefore, these kinds of farmers didn't pay attention to new agricultural information.

Four village extension workers indicated that considerable time was spent while transferring research results to farmers due to lack of linkages with researchers.

Researchers' Opinions about the T&V

Four (4) of the respondents agreed that the T&V system is a well-prepared system which facilitates coordination, communication and collaboration among researchers, extensionists and farmers. All the respondents expressed that the T&V provides researchers, subject matter specialists (SMS) and VEWs with training and education opportunities. They can refresh or supplement their knowledge. They said that with the implementation of the T&V system, all SMS's in Ankara province had been trained during the monthly meetings at province and district levels. VEWs were also trained in terms of practical and technical knowledge, more often than SMS's.

All the respondents concluded that with the implementation of the T&V system, demonstrations, field days, and on-farm trials had increased the level of extension and research activities. At the same time, with the demonstrations, field days, and on-farm trials, the results of the recommended practices could be seen by the farmers. Thus, the adoption level of improved practices was also increased compared to the old extension system.

Two researchers indicated that successful adoption of research results which increased the agricultural production and welfare of the farmers were encouraging researchers to work hard.

On the other hand, according to researchers, the following problems were the

main drawbacks for successful implementation of the T&V system. Four researchers said that the adoption of the T&V system by the extension service was slow. The amount of investment in agricultural research was not sufficient. Rolling (1988) also came to the same conclusion. Most research institutions still didn't have enough facilities, such as a library, agricultural equipment, machinery, lab, etc. Moreover, research institutions didn't have enough competent, skilled, knowledgeable researchers. Furthermore, a considerable number of researchers who had experience and skill transferred to private companies. Therefore, research institutions should be strengthened in terms of skilled and knowledgeable researchers.

Three researchers said that there was no demand from the farmers to obtain new knowledge and new agricultural techniques. Farmers could not be motivated by related organizations to feel the need for new techniques.

Two way flow of information among the farmers, extension and research, was not at the desirable level yet. There was especially a lack of communication between SMS's and VEWs in terms of exchanging knowledge. Therefore, researchers were not well informed about farmers' technical problems which should be the research topics.

Adoption Level of Recommended Wheat Practices

This section presents adoption level of high yielding wheat varieties and comparison of actual farmers' practices with improved wheat production practices.

Adoption of High Yielding Wheat Varieties

The total area cultivated by respondents was 28,380 decares of which 16,576 decares (58.4 percent) were devoted to winter wheat production and in 16,420 decares (99 percent) of the area high yielding wheat varieties were used. Only 156 decares (1

Table 4.8: Area sown and wheat varieties

Name of Wheat Varieties	Area Sown (decares)	Percent (%)
Bezostaya[a]	5,865	35.38
Bolal[a]	3,880	23.40
Gerek[a]	1,148	16.21
Haymana[a]	100	0.60
Atay[a]	329	2.00
Kunduru[b]	3,017	19.90
Çakmak[b]	263	1.60
Local varieties[a]	156	0.94
Total	16,578	

a– Macaroni wheat
b– Bread wheat

percent) of wheat planted were local wheat varieties. The area sown and the name of the wheat varieties are shown in Table 4.8.

The adoption level of high yielding varieties is not surprising, as in Turkey, the profitability of using high yielding varieties has been known since the introduction of the "green revolution" in the 1960s.

Comparison of Farmers' Practices with Recommended Practices

According to Cernea and Tepping (1977), the improvement of farm practices is the central emphasis in the Training and Visit System and the goal of the research component of the project. In addition to the survey-generated information on changes in farmers' practices, some ad hoc, in depth, studies on the actual changes in patterns of agricultural work might produce a very worthwhile insight.

In Part II of the questionnaires, farmers were asked to answer what their actual practices were, in terms of their tillage, seeding, fertilizer and weeding practices for

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Çakmak[b]	263	1.60
Local varieties[a]	156	0.94
Total	16,578	

a– Macaroni wheat
b– Bread wheat

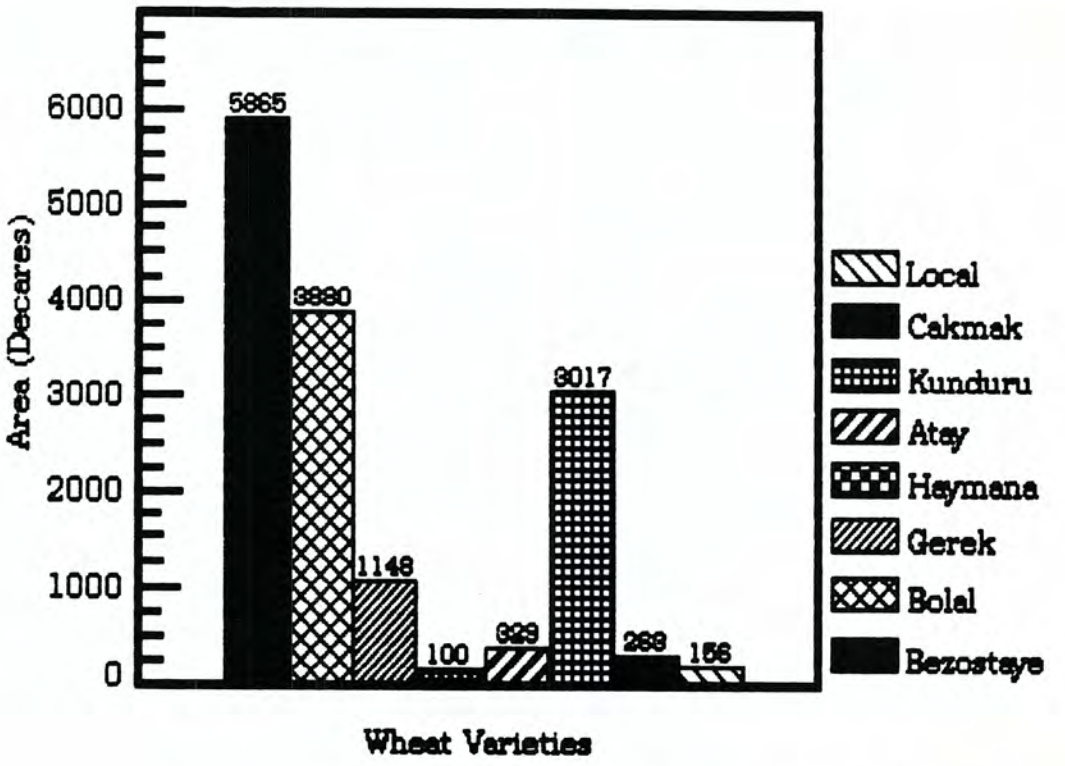

Figure 4.3: Area under different wheat varieties

wheat production. As mentioned before, recommended practices had been made by researchers in the Field Crop Research Center in Ankara Province. In order to obtain better wheat yields farmers were recommended to practice three tillages which were fixed with regard to time, equipment and depth for each of the tillage practices. Seeding methods were also fixed in terms of time, equipment, seed rate and seed depth. Fertilizer application, rate of nitrogen and phosphorous for different wheat varieties, application times for nitrogen and phosphorous, and weeding practices were also defined by the Field Crop Research Center.

To find out the adoption level of recommended wheat practices, it was decided to compare farmers' practices with recommended practices. The process from initial tillage to weeding practices, farmers' responses were coded according to their application of recommended practices. For example, when farmers practiced first tillage within the recommended times, March 10 to April 15, they were given 1, late tillage was given 2, and early tillage was given 3. If farmers did not do a second or third tillage, their response was coded 0. These codes were given to all the components of farmers' practices (Table 4.9).

The wheat yield ranged from 120 kg/decare to 400 kg/decare. The average wheat yield of respondents was 245kg/decare.

As shown in Table 4.9, the actual practices of farmers and practices recommended by the researchers through the extension services were similar in terms of initial tillage (time, equipment, depth), seeding time, seeding depth, seeding equipment and weeding practices. On the other hand, regarding second and third tillages (time, equipment, depth), seed rate, fertilizer application time and fertilizer rates, there was a considerable difference between recommended practices and farmers' actual

Table 4.9: Frequency of farmers' practices, compared with recommended practices and yields

		Code	Frequency	Percent
TILLAGES				
First Tillage				
Time				
	On time	1	53	71.6
	Late	2	21	28.4
Equipment				
	Recommended	1	74	100.0
Depth				
	Recommended	1	57	77.0
	Exceeded	2	17	23.0
Second Tillage				
Time				
	Not implemented	0	3	4.1
	On time	1	41	55.4
	Late	2	29	39.2
	Early	3	1	1.4
Equipment				
	Not implemented	0	3	4.1
	Recommended	1	25	33.8
	Non recommended	2	46	62.2
Depth				
	Not implemented	0	3	4.1
	Recommended	1	32	43.2
	Exceeded	2	39	52.7

Table 4.9 (Continued)

			Code	Frequency	Percent
TILLAGE *(cont'd)* *Third Tillage*					
	Time				
		Not implemented	0	11	14.9
		On time	1	18	24.3
		Late	2	45	60.8
	Equipment				
		Not implemented	0	11	14.9
		Recommended	1	26	35.1
		Non-recommended	2	37	50.0
	Depth				
		Not implemented	0	11	14.9
		Recommended	1	30	40.5
		Exceeded	2	33	44.6
SEEDING					
	Time				
		On time	1	70	94.6
		Late	2	1	1.4
		Early	3	3	4.1
	Equipment				
		Recommended	1	73	98.6
		Non-recommended	2	1	1.4
	Seed Rate				
		Recommended	1	21	28.4
		Above recommended	2	51	68.9
		Below recommended	3	2	2.7

Table 4.9 (Continued)

			Code	Frequency	Percent
SEEDING *cont'd*					
	Depth				
		Recommended	1	55	74.3
		Exceeding recommended	2	12	16.2
		Less than recommended	3	7	9.5
FERTILIZATION *Nitrogen Application*					
	Time				
		On time	1	34	45.9
		Late	2	30	40.5
		Early	3	10	13.5
	Rate				
		Recommended rate	1	21	28.4
		Above recommended	2	32	43.2
		Below recommended	3	21	28.4
Phosphorous Application					
	Time				
		On time	1	53	71.6
		Late	2	21	28.4
	Rate				
		Recommended	1	34	45.9
		Above recommended	2	18	24.3
		Below recommended	3	22	29.7
WEEDING (HERBICIDES)					
		Not implemented	0	7	9.5
		Implemented	1	67	90.5

Table 4.9 (Continued)

	Yield	Frequency	Percent
YIELD (kg/decare)			
	120	3	4.1
	130	2	2.7
	160	1	1.4
	195	1	1.4
	200	14	18.9
	220	1	1.4
	225	2	2.7
	240	4	5.4
	250	21	28.4
	260	4	5.4
	265	1	1.4
	270	2	2.7
	280	3	4.1
	285	1	1.4
	290	3	4.1
	300	6	8.1
	335	1	1.4
	350	2	2.7
	400	2	2.7

practices.

One-way analysis of variance was used to determine if significant differences existed in wheat yields when farmers were grouped according to implementation of selected components of recommended wheat production practices; second and third tillages, seed rate application, nitrogen application time and rate, phosphorous application rate, and weeding practice. The Scheffé test was performed to locate the sources of differences when a significant difference (0.05 level) was found.

The results of the one-way analysis of variance on the wheat yields when farmers were grouped according to time of application of second tillage are displayed in Table 4.10. A significant difference was found among the groups, at .0022 level. The Scheffé test (Table 4.11) revealed that no significant differences were detected among farmers regarding wheat yields for farmers who implemented late, early or within the recommended period of time. However, a significant difference was found at .05 level between farmers who implemented the second tillage within the recommended time and farmers who didn't implement second tillage. The findings suggest that implementing second tillage is an important component that can improve the wheat yield. But, based on the Scheffé test, implementing the second tillage late or early did not result in any difference in wheat yield.

Table 4.12 shows the result of the one-way analysis of variance on wheat yield when farmers were grouped according to application of second tillage depth. A significant difference was found on wheat yields when farmers were grouped according to implementation of second tillage depth. The Scheffé test (Table 4.13) indicated at the 0.05 level that farmers who implemented second tillage at more than the recommended depth or according to the recommended depth had higher yields than farmers

who did not implement a second tillage. No difference was detected between farmers who implemented according to the recommended second tillage depth and farmers who exceeded the recommended depth. The findings indicated that implementation of a second tillage resulted in a higher yield, but wheat yield was not affected by second tillage depth.

Table 4.14 shows the results of the one-way analysis of variance on wheat yield when farmers were grouped according to application time of third tillage. A highly significant difference among the groups regarding wheat yields was found. The outcome of the Scheffé tests (Table 4.15) at the .05 level indicated that farmers who implemented a third tillage with the recommended equipment had higher yields than farmers who implemented a third tillage with non-recommended equipment and farmers who did not implement a third tillage. Also significant differences in yields were found between farmers who implemented a third tillage with non-recommended equipment and farmers who did not implement a third tillage. The findings indicated that it is important for farmers to implement a third tillage with recommended equipment in order to increase wheat yield.

Table 4.16 shows the outcomes of the one-way analysis of variance on wheat yield when farmers were grouped according to application of third tillage with recommended equipment. Significant differences were found among the groups, at .0001 level. The results of the Scheffé tests (Table 4.17) at the .05 level showed that farmers who implemented a third tillage with recommended equipment or non-recommended equipment harvested more wheat than farmers who did not implement a third tillage. However, no significant difference was found between farmers who implemented a third tillage within the recommended equipment and farmers who implemented a

Table 4.10: Analysis of variance when farmers were grouped according to application time of second tillage

Group	N	Mean Yield (kg/da)	F-value	F-Prob.
Group 1 *Farmers who implemented second tillage within the recommended time*	41	260.0	5.38	0.0022
Group 2 *Second tillage implemented later than recommended time*	29	233.0		
Group 3 *Second tillage implemented earlier than recommended time*	1	250.0		
Group 4 *Second tillage not implemented*	3	146.7		

third tillage with non-recommended equipment. The findings indicated that implementing a third tillage resulted in more yield, and the use of different equipment did not have a significant effect on wheat yield.

Table 4.18 shows the results of the one-way analysis of variance on the wheat yields when farmers were grouped according to rate of seeding. A significant difference was found among the groups regarding wheat yields. The Scheffé test (Table 4.19) revealed that Group 1 (farmers who adopted the recommended seed rate) had significantly higher yields than Group 3 (farmers who used less than the recommended seed rate). But, no significant differences were detected between Group 1 (farmers who used the recommended seed rate) and Group 2 (farmers who exceeded the rec-

Table 4.11: Scheffé test for variable yield according to application time of second tillage

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	-9.22	26.21	61.63	2.73
Group 1−Group 3	-137.76	10.00	157.76	
Group 1−Group 4	26.02	113.33	***200.65	
Group 2−Group 3	-164.69	-16.21	132.28	
Group 2−Group 4	-1.41	87.13	175.67	
Group 3−Group 4	-65.24	103.33	271.91	

Comparisons significant at the .05 level are indicated by "***"

Table 4.12: Analysis of variance when farmers were grouped according to application of second tillage depth recommendations

Group	N	Mean Yield (per decare)	F-value	F-Prob.
Group 1 *Farmers who implemented second tillage according to recommended tillage depth*	32	259.37	6.88	0.0019
Group 2 *Farmers who implemented second tillage and exceeded recommended tillage depth*	39	240.76		
Group 3 *Farmers who did not implement second tillage*	3	146.76		

Table 4.13: Scheffé test for variable yield according to application of second tillage depth recommendations

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	-12.03	18.61	49.24	3.12
Group 1−Group 3	35.15	112.71	***190.27	
Group 2−Group 3	17.14	94.10	***171.06	

Comparisons significant at the .05 level are indicated by "***"

Table 4.14: Analysis of variance when farmers were grouped according to implementation time of third tillage

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Farmers who implemented third tillage during the period of recommended time*	26	279.80	28.47	0.0001
Group 2 *Farmers who implemented third tillage later than recommended time*	37	243.91		
Group 3 *Farmers who did not implement third tillage*	11	166.36		

Table 4.15: Scheffé test for variable yield according to implementation time of third tillage

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	9.13	35.88	***62.64	3.12
Group 1−Group 3	75.84	113.44	***151.04	
Group 2−Group 3	41.652	77.55	***113.45	

Comparisons significant at the .05 level are indicated by "***"

Table 4.16: Analysis of variance when farmers were grouped according to application equipment of third tillage

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Used recommended equipment*	30	272.50	24.23	0.0001
Group 2 *Used non-recommended equipment*	33	246.21		
Group 3 *Did not implement third tillage*	11	166.36		

Table 4.17: Scheffé test for variable yield according to application equipment of third tillage

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	-1.01	26.29	63.58	3.12
Group 1−Group 3	68.00	106.14	***144.27	
Group 2−Group 3	42.18	79.85	***117.52	

Comparisons significant at the .05 level are indicated by "***"

ommended seed rate). The findings suggest that farmers do not benefit from using more than the recommended seed rate, in fact, it only increases their costs.

Table 4.20 indicates the results of the one-way analysis of variance on wheat yields when farmers were grouped according to nitrogen application time. A significant difference was found among the groups regarding yields.

The Scheffé test (Table 4.21) indicated that farmers who applied nitrogen within the recommended period of time gained higher yields than farmers who did not, indicating that nitrogen application time also influences the wheat yield.

Table 4.22 presents the outcomes of the one-way analysis of variance on wheat yields when farmers were grouped according to nitrogen application rate. A highly significant difference was found among the groups. The results of the Scheffé test (Table 4.23) at the.05 level, indicated that farmers who applied more or less than recommended rates had smaller yields than farmers who applied recommended nitrogen rates. It was concluded that using more than the recommended nitrogen rates does nothing but create additional expense for farmers.

Table 4.24 presents the analysis of variance on the wheat yields when farmers

Table 4.18: Analysis of variance when farmers were grouped according to seeding rate

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Recommended seeding rate*	21	267.1	4.76	0.0115
Group 2 *Exceeded the recommended seeding rate*	51	239.2		
Group 3 *Used less than the recommended seeding rate*	2	160.0		

were grouped according to application rates of phosphorous. The findings indicated that there was a significant difference among the groups, at .0009 level. The Scheffé test (Table 4.25) revealed that farmers who applied recommended phosphorous rates produced more wheat than farmers who applied more or less than recommended. The findings suggest that using more phosphorous than recommended does not increase the wheat yields.

Table 4.26 shows the analysis of variance on the wheat yields when farmers were grouped according to weeding practices. Highly significant differences were found, .001 level, between the groups regarding their wheat yield, indicating that farmers who applied herbicides had higher wheat yields than farmers who did not apply chemical weeding practices.

The responses of the farmers in the study were graded according to adoption of recommended practices. For each of the practices, they adopted, they were given a 1; all other practices such as late tillages, exceeding recommended seed rate, fertilizer rate or not practicing second or third tillages were given zeros. For example,

Table 4.19: Scheffé test for variable yield according to seeding rate

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	-6.24	27.93	62.10	3.12
Group 1−Group 3	9.62	107.14	***204.67	
Group 2−Group 3	-174.21	-79.22	15.78	

Comparisons significant at the .05 level are indicated by "***"

Table 4.20: Analysis of variance when farmers were grouped according to nitrogen application time

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Applied nitrogen within the recommended time*	35	269.5	7.76	0.0009
Group 2 *Applied nitrogen later than the recommended time*	29	223.2		
Group 3 *Applied nitrogen earlier than the recommended time*	10	222.0		

Table 4.21: Scheffé test variable yield according to nitrogen application time

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	14.37	46.30	78.22	3.12
Group 1−Group 3	1.98	47.57	***93.16	
Group 2−Group 3	-45.35	1.28	47.90	

Comparisons significant at the .05 level are indicated by "***"

Table 4.22: Analysis of variance when farmers were grouped according to nitrogen application rates

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Recommended nitrogen rate*	21	290.7	13.56	0.0001
Group 2 *Exceeded recommended nitrogen rate*	32	229.5		
Group 3 *Less than recommended nitrogen rate*	21	222.8		

Table 4.23: Scheffé test for variable yield according to nitrogen application rate

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	27.66	61.18	***94.71	3.12
Group 1−Group 3	31.02	67.86	***104.70	
Group 2−Group 3	-26.85	6.67	40.20	

Comparisons significant at the .05 level are indicated by "***"

Table 4.24: Analysis of variance when farmers were grouped according to phosphorous application rates

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Recommended phosphorous rates*	34	270.29	7.79	0.0009
Group 2 *Exceeded recommended phosphorous rates*	18	224.44		
Group 3 *Less than recommended phosphorous rates*	22	222.72		

Table 4.25: Scheffé test for variable yield according to phosphorous application rates

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	8.81	45.85	***82.89	3.12
Group 1−Group 3	12.79	47.57	***82.34	
Group 2−Group 3	-38.67	1.72	42.11	

Comparisons significant at the .05 level are indicated by "***"

Table 4.26: Analysis of variance when farmers were grouped according to weeding practices

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 *Farmers who applied chemical weed killer*	68	253.97	31.11	0.0001
Group 2 *Farmers who did not apply chemical weed killer*	6	143.33		

respondent number 1 was graded below according to the explained process.

ID	1		
	Time	Equipment	Depth
First Tillage	1	1	1
Second Tillage	1	1	0
Third Tillage	0	0	0

ID	1			
	Time	Equipment	Seed Rate	Depth
Seeding	0	1	0	1

ID	1			
	Nitrogen		Phosphorous	
	Time	Rate	Time	Rate
Fertilization	0	0	1	1

	Chemical	None
Weeding	1	0

Respondent number one (1) got ten (10) grades. A farmer who adopted all the recommended practices would have obtained eighteen (18), which was the top grade. The number of respondents was 74, which means that if all farmers had adopted recommended practices, the total grade would be 74 X 18 = 1,332.

In this sample, after adding the grades, which were given to the respondents according to their adoption of recommended practices, the total grade was found to be 784. Thus, it can be said that fifty-nine percent (59%) of the recommended practices have been adopted by farmers.

Farmers were grouped according to their adoption level of all components of recommended practices in order to check if there was a relation between adoption level of recommended practices and wheat yields.

The one-way analysis of variance test was used to determine if significant differences existed in wheat yields when farmers were grouped according to adoption

Table 4.27: Adoption levels of components of recommended practices

Type	Group	Grade	Considered a:	Number of adopters	Percentage
Innovator	Group 1	18-16	Full adopter	7	9.4
Early adopter	Group 2	15-13	Almost adopter	7	9.4
Early majority	Group 3	12-10	Average adopter	27	36.2
Late majority	Group 4	9-7	Late adopter	29	38.9
Laggards	Group 5	¡7	Non-adopter	4	6.1

categories. the Scheffé test was performed to locate the sources of differences when significance (.05 level) was found. Table 4.27 shows the result of the analysis of variance on wheat yield when farmers were grouped by adoption categories. A highly significant difference among groups was found on the wheat yield. The results of Scheffé tests at the .05 level indicated that there were significant yield differences between the full adopter and the average, late and non-adopter. Also, significant differences were found between the almost adopter and both the late adopter and non-adopter. There were significant differences between the average adopter and the late adopter as well, but no significant difference was detected between the full adopter and the almost adopter, the almost adopter and the average adopter, or the late adopter and the non-adopter which related to wheat yield. The findings suggest that as adoption level of recommended practices increased, the wheat yields increased as well.

Reasons for Non-Adoption

This section describes the reasons of Ankara farmers for non-adoption of recommended practices.

Table 4.28: Analysis of variance on wheat yield when farmers were grouped by adoption categories

Group	N	Mean Yield (kg/decare)	F-value	F-Prob.
Group 1 (full adopter)	7	340.71	21.94	0.0001
Group 2 (almost adopter)	7	286.42		
Group 3 (average adopter)	27	253.70		
Group 4 (late adopter)	29	212.75		
Group 5 (non-adopter)	4	180.00		

Table 4.29: Scheffé test for wheat yield according to adoption categories

Group Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Higher Confidence Limit	F-Value
Group 1−Group 2	-9.62	54.28	118.19	2.50
Group 1−Group 3	36.29	87.01	***137.72	
Group 1−Group 4	77.60	127.95	***178.30	
Group 1−Group 5	85.77	160.71	***235.65	
Group 2−Group 3	-17.98	32.72	***83.43	
Group 2−Group 4	23.31	73.67	***124.02	
Group 2−Group 5	31.48	106.42	***181.37	
Group 3−Group 4	8.96	40.94	***72.92	
Group 3−Group 5	9.64	73.70	***137.76	
Group 4−Group 5	-31.01	32.75	96.53	

Comparisons significant at the .05 level are indicated by "***"

The 74 respondents were asked what their reasons were for non-adoption of recommended practices through the questions in Part II.

Almost all farmers (71) said that recommended practices are useful, however, a majority of them (54) indicated that inputs were very expensive, and more than half of the respondents (49) said that inputs were not available when needed. Seven farmers complained about marketing and ten farmers stated that they lacked laborers.

It can be concluded that farmers were aware of recommended practices, they knew that recommended practice was useful, but, lack of capital and unavailability of the inputs within the appropriate time were their main reasons for non-adoption. Village Extension Workers also had the same perceptions that inputs were expensive and could not be provided to farmers at the appropriate time. Could it be that these reasons stated by Village Extension Workers and farmers were the only reasons for non-adoption?

Based on the farmers' actual practices, almost all farmers were convinced to use fertilizer, high yielding varieties and chemicals, although a considerable number of farmers had not implemented or adopted recommended practices regarding second generation inputs, such as seed rate, fertilizer rates and application time, and second and third tillages (equipment, time, depth).

According to reasons stated by the farmers and the VEWs, non-adoption for fertilizer application time and using non-recommended equipment could be attributed to expense and unavailability of fertilizer and equipment and lack of laborers. But, what about using more than the recommended nitrogen and phosphorous rates and using more than the recommended seed rates? Even if it was difficult for farmers to buy and provide these inputs at the appropriate time, farmers seemed to be aware of

the benefits of using them, and some suffered financially to buy them, and used more than they needed to use. It can be concluded that non-adoption occurred not only because of expenses and availability, but also, because of lack of knowledge, information and education. The implication of the farmers' lack of capital, the expenses of the inputs, and more importantly, lack of knowledge and education on the efficient use of inputs, are created a vicious circle. For example, some farmers suffered to buy inputs and then used them inefficiently, resulting in high cost production and low yields. Then, as usual, the next season the cost of inputs increase, resulting in even higher costs for farmers. As a result, the system perpetuates itself and worsens the existing problems for farmers who don't have knowledge and information about efficient use of inputs.

In other words, complexity, lack of enough information or education on the second generation inputs and a partial inaccessibility of needed inputs were the main reasons for non-adoption. On the other hand, recommended practices had relative advantages (Uzunlu & Özcan, 1988), and were compatible with existing practices of farmers.

Triangularization of Data Summary

According to Donald (1983), four main ways in which data generated by different methodologies will cluster around a given topic are: separate information with little overlap, convergent overlap, divergent overlap, and inconclusive overlap. Taking a look at the answers given by the three target groups; farmers, VEWs and researchers, the researchers found that they have the same judgements about the worth or merit of the T&V System. It can be said that farmers', VEWs and researchers' perceptions of

the T&V system were convergently overlapped. They agreed that the T&V extension system has brought about a large amount of development in the agricultural sector. According to farmers, the quality of services received from the extension agency significantly increased after the implementation of the T&V System (Table 4.7). Like farmer respondents, VEWs and researchers had the same opinion of the T&V extension system: with the implementation of the T&V System their activities have increased, consequently, agricultural production has also increased due to research and extension efforts.

Although extension personnel were perceived by farmers as a most important information source, VEWs indicated that they didn't have the experience and enough technical, practical knowledge to respond to farmers who are involved in poly-cultural agriculture. However, researchers claimed that VEW;s had been trained in terms of practical, technical knowledge during the monthly meetings. It can be understood that either VEWs were not satisfied with the training sessions, or these training sessions could not meet the needs of the VEWs.

Under the T&V System, VEWs are supposed to be trained by Subject Matter Specialists during the fortnightly meetings (Benor & Baxter, 1984). As it was indicated by the researchers, there was a serious problem in terms of establishing communication between Subject Matter Specialists (SMS's) and VEWs.

Researchers and Village Extension Workers agreed that two-way flow of information process was slow and sometimes incomplete between the researchers, extension workers and farmers. Researchers claimed that they hadn't been informed about farmers' problems which should be their research topics; on the other hand, VEWs stated that a considerable amount of time was spent obtaining research results in

order to communicate the results to farmers.

It can be concluded that both researchers and VEWs were right from their own standpoint. Due to lack of facilities and experienced researchers, it took too much time for researchers to find out the solution to a number of farmers' problems. On the other hand, when each VEW could not get timely answers to their problems, they were reluctant to communicate farmers' problems to the researchers. Moreover, lack of transportation and teaching aids was another big obstacle for VEWs in reaching farmers.

The reasons mentioned above appear to have resulted in either incomplete or slow information processes among the research, extension and farming subsystem.

CHAPTER 5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The main purpose of this study was to assess the impact of the Training and Visit system on the transfer of improved wheat technology to farmers in Ankara, Turkey. The study was conducted to:

1. Identify selected demographic characteristics of farmers in Ankara.
2. Identify perceptions of the Training and Visit system by farmers, Village Extension Workers and researchers.
3. Identify adoption level of recommended wheat technology by farmers.

This chapter is presented in four sections: 1) Summary, 2) Conclusions, 3) Recommendations, and 4) Recommendations for further study.

Summary

The study was conducted using descriptive survey methods to identify characteristics of Ankara farmers, to provide information on the perceptions of the farmers, Village Extension Workers and researchers toward the extension activities via the T&V system and to determine the adoption level of recommended wheat practices by farmers in Ankara.

The population of the study included eighty-four (84) farmers from randomly selected villages in Ankara, eighteen (18) Village Extension Workers and four (4) researchers. From the farmer respondents, 88% (seventy-four) questionnaires were considered usable. Eleven VEWs and four researchers participated in this study.

Quantitative closed-ended questions were used to gather data from the farmers, quantitative closed-ended questions and qualitative open-ended questions were both used to obtain information from the VEWs, and qualitative open-ended questions were used to get information from the researchers.

The personal interview technique was used to collect data. Initially, the research was proposed to the Farmer Training and Extension Service in Ankara. The research was approved by the extension agency, then questionnaires were mailed out to the headquarters of the Ankara Province Farmer Training and Extension Service agency on February 12, 1990. Extension staff collected the data on behalf of the researcher through personal interviews with farmers, VEWs and researchers between February 26, 1990, and March 13, 1990.

Qualitative data were interpreted using content analysis and descriptive statistical procedures were used to analyze the quantitative data, utilizing the Statistical Package Programs (SAS).

Appropriate statistical procedures were used to analyze and summarize the data. The subprogram FREQUENCIES was used to analyze the means, standard deviations, frequencies and percentages. The subprogram NPAR1WAY analysis of variance was used to test the differences among farmers' familiarity with the T&V system when farmers were grouped according to selected demographic characteristics. The paired t-test was used to determine the perception of Ankara farmers about the qual-

ity of services from the local extension agency before and after the implementation of the T&V system. The subprogram PROC GLM was used to test for significant differences among farmers' wheat production when farmers were grouped according to adoption level of recommended wheat practices.

Conclusions

The results of the study, the effect of the T&V system on the transfer of improved wheat technology to farmers in Ankara indicates that respondents from the farmers, extension, and research sub-systems have the same perceptions that T&V system has not only led to considerable development of wheat technology and wheat production, but has also given rise to increased extension and research activities.

Although familiarity with extension programs were rated (3.66) by farmers less than mid-point (4) on the familiarity scale, the quality of services received from the extension after the implementation of the T&V system was rated (4.72) higher by farmers than before the implementation of the T&V system (3.70). The paired t-test revealed that since the implementation of the T&V system, the quality of services perceived by farmers was significantly higher than the quality of services before the T&V system.

Based on the research findings, the respondents were very similar in their familiarity with extension programs when respondents were grouped by age, farm size, education and occupation.

According to farmers, the following sources of information were the most important to them, in rank order, extension personnel, television/radio, friends/neighbors, newspaper/magazines and private companies.

The demographic characteristics of farmer respondents were as follows:

79.6% farmed between 40 and 500 decares

31.4% operated rented land

86.5% were full-time farmers

82.0% had medium or large families with a mean size of 6.7

75.7% had a 5th grade education

The age of respondents ranged from twenty-six (26) to sixty-six (66) with an average of forty-seven (47).

The data indicated that most of the VEWs lacked experience and needed more training regarding technical and practical knowledge. Moreover, they lacked teaching aids and transportation facilities which hindered them from visiting farmers on a timely and regular basis. Demonstration was the most used technique by VEWs to transfer wheat technology to farmers.

The results of the study indicated that lack of facilities, such as libraries, labs, transportation, and an inadequate number of researchers, were the main reasons for failure to respond immediately to farmers problems in addition to linking the research and extension.

Regarding the adoption level of recommended practices, 58.4% cultivated land was devoted to wheat crops, of which 19.6% was macaroni wheat and 81.4% was bread wheat. Ninety-nine percent of the this area was planted in high yielding wheat varieties. Fifty-nine percent of the recommended practices were adopted by farmers

considering each component of the recommended practices from initial tillage to harvesting.

Most of the farmers had implemented first, second and third tillage (63 of 74 respondents). All of the respondents had applied nitrogen and phosphorous. Sixty-seven (67) of seventy-four (74) respondents applied chemical herbicides.

Almost all respondents had planted wheat within the period of recommended seeding time. On the other hand, the adoption level of seed, nitrogen and phosphorous application rates was relatively low compared to other recommended wheat practices. Fifty-one (51) out of seventy-four (74) applied nitrogen at more or less than the recommended rate, and forty (40) out of seventy-four (74) applied phosphorous at more or less than recommended phosphorous rates.

The data also indicated that in terms of second and third tillage recommendations, (time, equipment, and depth) a considerable number of farmers had different practices than the recommended wheat practices improved by researchers.

Data from farmers and Village Extension Workers indicated that expenses and unavailability of inputs were the main reasons for non-adoption of recommended practices. However, research results indicated that lack of knowledge and information on the part of the farmers was the other important reason. Following were the main obstacles to better implementation of T&V from the researcher's analysis of data, review of literature and personal experiences:

- Lack of facilities both in extension and research.
- Lack of practical and technical knowledge and lack of experience of VEWs.
- Lack of motivation and education of farmers.

- Lack of communication and coordination between extension and other agricultural organizations, especially input/supply organizations.

These interrelated and interconnected obstacles within the agricultural information system brought about a slow or incomplete two way information process and a lack of linkages among the farmer, extension, and research sub-systems.

Research results also showed that there was relevant technology in research which was available to farmers regarding wheat production. This competitive technology had a relative advantage and was triable, but was complex and not readily accessible to farmers.

Recommendations

This study was conducted to determine and analyze the effect of the T&V system on the transfer of wheat technology to farmers in Ankara. Based on the research results, the following suggestions are made:

1. Farmers should be encouraged and motivated to participate in extension activities. Extension program planning should be approached from the clientele point of view.

2. Necessary facilities should be made available to extension and research organizations.

3. In addition to demonstration activities, mass media, meetings and extension publications should be used to educate farmers.

4. To extend the practical and technological knowledge of the VEWs, training activities should be promoted.

5. Experienced VEWs should be assigned to villages.

6. The concept that extension is not only the transfer of technology, but also education issues should be understood. Most importantly, the agricultural information system must be understood as a whole.

Recommendations for Further Research

Following the example of this study, existing research results regarding other crops, barley, rye and pulses, lentils and chick-peas, and farmers actual practices can be compared to investigate the differences between them.

Within the agricultural information system, each subsystem can be studied in more detail. For example, a needs assessment can be conducted to examine the practical and technical needs of extensionists and researchers.

In order to determine the effect of the T&V system on the adoption of improved practices, two provinces where one is converted to the T&V system and the other one is not, can be studied.

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APPENDIX A. CORRESPONDENCE

Letter to Ankara Province Farm Training and Education Center

Letter from Ankara Province Farm Training and Education Center

TO: Riza Rencberoglu
Head, Ankara Province
Agricultural Education and
Extension Service
Ankara, Turkey

FROM: Agricultural Education Dept.
Iowa State University
223 Curtiss Hall
Ames, Iowa 50011

I am in my final semester for my M.S. Degree in Agricultural Education at Iowa State University. I have proposed a study to assess the impact of technology transfer in wheat production in Ankara Province. I believe that your experience in this subject can be combined with my efforts to benefit local farmers.

I therefore request you to carry out the data collection procedure as described below:

I. Please make 120 copies of parts I thru III of the enclosed questionnaire.

A. Please select 3 districts at random from the leading wheat producing districts of Ankara Province.

B. Select 4 villages at random from each of the above three districts.

C. Finally, randomly select 10 farmers in each of the selected villages.

D. Thus, there will be 120 farmers selected for the purpose of filling out parts I thru III of the enclosed questionnaire.

II. Please make 18 copies of part IV of the questionnaire and request the extensionists involved in data collection to answer part IV.

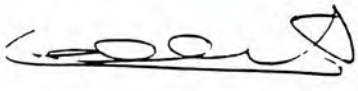
III. Please fill out part V of the questionnaire yourself.

IV. Please have Part VI of the questionnaire filled out by the Coordinator of the Agriculture Applied Research and Extension Project.

I hope to get this data for analysis at your earliest convenience. I appreciate your cooperation in conducting this study.

Thank you.

Vedat Uzunlu



T. C.
TARIM ORMAN ve KÖYİŞLERİ BAKANLIĞI
A N K A R A
İ L M Ü D Ü R L Ü Ğ Ü

Sayı : ÇEY/128-

Konu : Anket Formu.

ANKARA
14./2.../1990

Vedat UZUNLU
Ziraat Yüksek Mühendisi

Tarımsal Yayım çalışmalarının çiftçilerin üzerindeki etkileri ve özellikle Buğday verimine tesirleri konusunda yapmış olduğunuz çalışmaya yardımcı olmak üzere Ankara İlçe ve Köylerinde çiftçilerle 26.1.1990 ila 13.2.1990 tarihleri arasında anket uygulaması yapılmış olup, yazı ekinde gönderilmektedir.

Anketlerle ilgili sonuç ve değerlendirmelerin tarafımıza bilahare göndermeniz ricasıyla çalışmalarınızda başarılar dilerim.

Rıza REÇBEROĞLU
ÇEY. Şube Müdürü

EKİ: 79 Ad. Çiftçi Anketi
11 Ad. Teknik eleman anketi
16 Ad. Örnek çiftçi envanteri
1 Ad. Ankara ile ilgili bilgiler

APPENDIX B. QUESTIONNAIRES

Questionnaire in English

ASSESSING THE IMPACT OF THE EXTENSION
TRAINING AND VISIT SYSTEM ON THE TRANSFER OF
WHEAT TECHNOLOGY FARMERS IN ANKARA, TURKEY

INTERVIEW

The goal of this study is to identify the current wheat technology used by farmers and their problems related to wheat production. Also under analysis is the interaction among the Research Institution, Extension Service, and the farmers. I want to express my appreciation in this joint effort. Your reading of the questions and careful and accurate recording of the data will also be greatly appreciated.

PART I. TO THE FARMER

1. What kind of wheat have you grown and how many donums have you planted of each?

Name of the Varieties	Donums
_____	_____
_____	_____

_____ _____

_____ _____

2. Using a 1−7 scale with 1 being the lowest and 7 the highest rating, how familiar are you with the Agricultural Applied Research and Extension Project? (circle the appropriate number)

Low						High
1	2	3	4	5	6	7

3. Please rate the service received from the Agricultural Organization since 1985, using the 1−7 scale.

Low						High
1	2	3	4	5	6	7

4. Please rate the service received from the Agricultural Organization before 1985, using the 1−7 scale as above.

Low						High
1	2	3	4	5	6	7

5. How important are each of the following source of information in solving problems wheat production?

Source of information	Low						High
Extension personnel	1	2	3	4	5	6	7
Extension publication	1	2	3	4	5	6	7
Newspaper/Magazine	1	2	3	4	5	6	7
TV/Radio	1	2	3	4	5	6	7

Friends/neighbors	1	2	3	4	5	6	7
Private company	1	2	3	4	5	6	7

6. Please check any of the following problems you have related to wheat production.

_____ Insects

_____ Weeds

_____Diseases

_____Other

PART II. WHEAT PRODUCTION PRACTICES

1. For fallow-wheat systems

	Date (Month/Day) (e.g., March 1−15)	Equipment	Depth (cm.)
Initial tillage	_____	_____	_____
Spring tillage	_____	_____	_____
Summer tillage	_____	_____	_____

	Date (Mo/Day)	Rate (Kg/Da)	Equipment	Depth (cm.)	Seed Variety
Seeding	_____	_____	_____	_____	_____

	Rate (Kg/Da)	Application Time	Applicaton Method
Fertilization			
Nitrogen	_____	_____	_____
Phosphrus	_____	_____	_____
Weed Control	_____	_____	_____

Harvesting _____Equipment

Marketing _____TMO _____Private Company

Wheat Yield:_____Kg/decare

2. Reason for not adopting? (Check all that apply)

_____ Too expensive

_____ Poor quality of seed

_____ Recommended processes not useful

_____ Input unavailable

_____ Lack of market

_____ Lack of labor

_____ Other (specify)

Name of District:

Name of Village:

PART III. INFORMATION ABOUT THE FARMER AND THE FARM

1. What is your age? _____years

2. How many persons are currently living in your household? _____people

3. What is your level of education?

   _____ No education

   _____ Primary certificate

   _____ Intermediate certificate

   _____ Secondary certificate

   _____ College or university degree

4. Is farming your sole occupation? _____Yes _____No

   If no, what kind of work do you do besides farming?

5. What is the total area of your farm? _____Donums(1000 sq. meters)

   How much of this area is rented on

   A share basis _____

   A cash basis _____

6. How many donums do you currently cultivate? _____ Donums

PART IV. TO THE EXTENSIONIST

1. How long have you been an extensionist? _____

2. Please briefly explain your responsibilities.

3. What is your opinion about the Agricultural Applied Research and Extension Project?

4. What do you consider to be the main drawback for implementing the Agricultural Applied and Research Project?

5. Approximately how many times do you visit farmers in your area?

	Contact Farmers	Non-Contact Farmers
Once a week	_____	_____
Twice a month	_____	_____
Once a month	_____	_____
Less frequently (specify)	_____	_____

6. Using the 1−7 scale with 1 being lowest and 7 being highest, rate your level of use in the last year of the following methods to introduce new technologies to the farmers:

Source of information	Low						High
Demonstration	1	2	3	4	5	6	7
Field Trip	1	2	3	4	5	6	7
Slides/Film	1	2	3	4	5	6	7
Farm visit	1	2	3	4	5	6	7
Meeting	1	2	3	4	5	6	7
Brochure	1	2	3	4	5	6	7

7. Please briefly explain what you see as the strengths and the weaknesses of the Agricultural Applied Research and Extension Project.

PART V. TO THE RESEARCHERS

Please briefly explain your opinion of the Agricultural Applied Research and Extension Project in regard to the relationship between the Extension Service and the training of extensionists.

Questionnaire in Turkish

TARIMSAL YAYIM VE UYGULAMA ARAŞTIRMA
PROJESİNİN BUGDAY URETİM TEKNOLOJİSİNE ETKİSİ

ANKET FORMU

Bu çalişmanin amaci, Ankara ilindeki çifçilerin bugday üretiminde kullandigi tarim tekniklerinin ve konu ile ilgili problemlerinin belirlenmesidir. Ayrica çalişmada Araştirma Kuruluşu ÇiftçiEgitim Yayim Şube Müdülügü ve çiftçiler arasindaki ilişkilerin belirlenmesive TYUAP projesinin uygulanmasinda karsilasilan problemlerin tesbit edilmesi hedeflenmistir.

Bu calismaya katildiginiz ve anket formunu dikkatle doldurdugunuz icin tesekkur ederim.

BOLUM I. CIFTCILERE SORULACAK SORULAR

1. Hangi bugday cesitlerini yetistiriyorsunuz? Her birinden kac donum ekiyorsunuz?

Bugday Cesidi Adi	Ekilen Alan (donum)
_____	_____
_____	_____
_____	_____
_____	_____

2. Tarimsal Yayim ve Uygulamali Arastirma Projesi hakkinda bilgi sahibimisiniz? Boyle bir projenin uygulandigindan haberiniz varmi? Varsa ne olcude (Asagidaki olcegi isaretleyiniz.1. ciftci proje hakkinda bilgi sahibi degil 2,3,4,5,6 git-

tikce artan olcude bilgi sahibi).

Cok az						Cok fazla
1	2	3	4	5	6	7

3. Tarim kuruluslarindan 1985 den beri edindiginiz hizmetleri degerlendirin.

Cok az						Cok fazla
1	2	3	4	5	6	7

4. Tarim kuruluslarindan 1985 den once edindiginiz hizmetleri degerlendirin.

Cok az						Cok fazla
1	2	3	4	5	6	7

5. Bugday uretimi ile ilgili problemlerinizi cozmede assagidaki bilgi kaynaklari ne olcude onemlidir?

Bilgi Kaynaklari	Cok az						Cok fazla
Ilce tarim kurulusu	1	2	3	4	5	6	7
Teknik Ziraatin yayinlari	1	2	3	4	5	6	7
Gazete ve dergiler	1	2	3	4	5	6	7
TV/Radyo	1	2	3	4	5	6	7
Komsular	1	2	3	4	5	6	7
Ozel sirketler	1	2	3	4	5	6	7

6. Bugday uretimi ile ilgili problerinizi isaretleyiniz.

_____ Bocek

_____ Yabanci ot

_____ Hastalik

_____ Digerleri

BOLUM II. BUGDAY URETIM TEKNIKLERI

1. Nadas-Bugday Sistemi

	Zamani(ay/gun)	Aleti	Derinlik (cm)
Ilk surum	_____	_____	_____
Ikinci surum	_____	_____	_____
Ucuncu surum	_____	_____	_____

	Zaman (Ay/Gun)	Tohumluk (Kg/Da)	Aleti	Derinlik (cm.)	Ekilen cesidi adi
Ekim	_____	_____	_____	_____	_____

	Dozu (Kg/Da)	Uygulama Zamani	Uygulama Methodu
Gubreleme			
Azotlu gubre	_____	_____	_____
Fosforlu gubre	_____	_____	_____
Ot kontrolu	_____	_____	_____

Hasat _____Aleti

Pazarlama _____TMO _____Tuccar

Bugday verimi:_____Kg/dekar

2. Bugdayla ilgili onerilen tekniklerin uygulanmama sebepleri.

_____ Cok pahali

_____ Tavsiye ediolen teknikler faydali degil

_____ Girdiler temin edilemiyor

_____ Pazarlanamiyor

_____ Is gucu yeterli degil

_____ Digerleri

Ilcesi:

Koyu:

BOLUM III. CIFTCI VE ISLETMESI HAKKINDA BILGILER

1. Yasiniz? _____

2. Hane halki sayiniz? _____

3. Tahsil dereceniz?

_____ Okuma yazmasi yok

_____ Ilkokul

_____ Ortaokul

_____ lise

_____ Yuksek tahsil

4. Ciftcilikten baska is yapiyormusunuz? _____Evet _____Hayir

Evet ise, ne is yapiyorsunuz?

5. Kac donum araziniz var? _____Dekar(1000 sq. meters)

   Bu arazinin kac donumunu kiraladiniz?

   Kira_____

   Ortak_____

6. Her yil ortalama kac donum ekiyorsunuz? _____ Dekar

BOLUM IV. KOY GRUP TEKNISYENLERININ CEVAPLANDIRACAGI SORULAR

1. Kac yildan beri koy grup teknisyenisiniz?_____

2. Kisaca gorev ve sorumluluklarinizi aciklayiniz.

3. TYUAP ile ilgili dusuncelerinizi belirtiniz.

4. TYUAP in uygulamasinda ne gibi problemlerle karsilasiyorsunuz?

5. Ciftcileri ne kadar araliklarla ziyaret ediyorsunuz?

	Onder Ciftci	Normal Ciftci
Haftada bir	_____	_____
Onbes gunde bir	_____	_____
Ayda bir	_____	_____
Iki ayda bir	_____	_____

6. Gecen sene ciftcilere yeni teknikleri iletmede assagidaki methodlari ne olcude kullandiniz?(1: cok az, 7: cok fazla)

Kullanilan methodlar	Cok az						Cok fazla
Demostrasyonlar	1	2	3	4	5	6	7
Tarla gezileri	1	2	3	4	5	6	7
Silayt/film	1	2	3	4	5	6	7
Ciftci ziyaretleri	1	2	3	4	5	6	7
Toplantilar	1	2	3	4	5	6	7
Dergiler	1	2	3	4	5	6	7

BOLUM V. ARASTIRMACILARA SORULACAK SORULAR

TYUAP ile ilgili dusuncelerinizi belirtiniz. Simdiye kadar tarim teknisyenlerinin egitimi ile ilgili neler yaptiniz? Lutfen aciklayiniz.

APPENDIX C. HUMAN SUBJECTS FORM

INFORMATION ON THE USE OF HUMAN SUBJECTS IN RESEARCH
IOWA STATE UNIVERSITY
(Please follow the accompanying instructions for completing this form.)

1. Title of project (please type): Adoption Level of Agricultural Wheat Technology by Farmers in Ankara Province, Turkey

2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are properly protected. Additions to or changes in procedures affecting the subjects after the project has been approved will be submitted to the committee for review.

Vedat Uzunlu	1-24-90	
Typed Named of Principal Investigator	Date	Signature of Principal Investigator
223 Curtis Hall, Ames, Iowa 50011	294-0901	
Campus Address	Campus Telephone	

3. Signatures of others (if any)

	Date	Relationship to Principal Investigator
Dr. Julia Gamon		Major Professor

4. ATTACH an additional page(s) (A) describing your proposed research and (B) the subjects to be used, (C) indicating any risks or discomforts to the subjects, and (D) covering any topics checked below. CHECK all boxes applicable.

- ☐ Medical clearance necessary before subjects can participate
- ☐ Samples (blood, tissue, etc.) from subjects
- ☐ Administration of substances (foods, drugs, etc.) to subjects
- ☐ Physical exercise or conditioning for subjects
- ☐ Deception of subjects
- ☐ Subjects under 14 years of age and(or) ☐ Subjects 14-17 years of age
- ☐ Subjects in institutions
- ☒ Research must be approved by another institution or agency

RECEIVED JAN 30 1990 ISU GRADUATE COLLEGE

5. ATTACH an example of the material to be used to obtain informed consent and CHECK which type will be used.

- ☐ Signed informed consent will be obtained.
- ☒ Modified informed consent will be obtained.

6. Anticipated date on which subjects will be first contacted: Month Feb. Day 10 Year 90

Anticipated date for last contact with subjects: Month March Day 10 Year 90

7. If Applicable: Anticipated date on which audio or visual tapes will be erased and(or) identifiers will be removed from completed survey instruments: Month March Day 15 Year 90

8. Signature of Head or Chairperson | Date 1/22/90 | Department or Administrative Unit Ag. Education

9. Decision of the University Committee on the Use of Human Subjects in Research:

☐ Project Approved ☐ Project not approved ☐ No action required

George G. Karas		
Name of Committee Chairperson	Date	Signature of Committee Chairperson

APPENDIX D. AGRICULTURAL RESEARCH INSTITUTIONS IN TURKEY

I. Central-north Anatolia
Faculty of Agriculture–Ankara
Faculty of Veterinary Medicine–Ankara
College of Home Economics–Ankara
Plant Protection Research Institute–Ankara
Grassland and Animal Husbandry Research Institute–Ankara
Field Crop Center–Ankara
Poultry Research Institute–Ankara
Soil and Water Research Institute–Ankara
Soil and Fertilizers Research Institute–Ankara
Soil and Water Research Institute–Eskisehir
Agricultural Research Institute–Eskisehir

II. Aegan Sea Region
Faculty of Agriculture–Izmir
School of Water Production–Izmir
Agricultural Research Institute–Izmir
Soil and Water Research Institute–Izmir
Tobacco Research Institute–Izmir
Olive Culture Research Institute–Izmir

III. Marmara Region
Faculty of Agriculture–Tekirdag
Faculty of Agriculture–Bursa
Faculty of Veterinary Science–Istanbul
Faculty of Veterinary Science–Bursa
Faculty of Forestry–Istanbul

Horticultural Crops Research Institute–Yalova
Viticultural Research Institute–Tekirdag
Plant Protection Research Institute–Istanbul
Sericulture Research Institute–Bursa
Veterinary Microbiological Research Institute–Istanbul
Agricultural Research Institute–Edirne

IV. Mediterranean Region
Faculty of Agriculture–Antalya
Faculty of Agriculture–Adana
Agricultural Research Institute–Antalya
Biological Control Research Institute–Antalya
Agricultural Research Institute–Adana
Vegetable Research Institute–Antalya
Soil and Water Research Institute–Tarsus
Citrus Research Institute–Antalya

V. Northeast Anatolia
Faculty of Agriculture–Erzurum
Plant Protection Research Institute–Erzincan
Soil and Water Research Institute–Erzurum

VI. Southeast Anatolia
Faculty of Agriculture–Urfa
Faculty of Agriculture–Van
Faculty of Veterinary Science–Van
Plant Protection Research Institute–Diyarbakir
Agricultural Research Institute–Diyarbakir
Soil and Water Research Institute–Urfa

VII. Black Sea Region
Faculty of Agriculture–Samsun
Faculty of Forestry–Trabzon
School of Fishery–Samsun
Plant Protection Research Institute–Samsun
Hazelnut Research Institute–Giresun
Agricultural Research Institute–Samsun
Soil and Water Research Institute–Samsun

VIII. Central-east Anatolia

Faculty of Agriculture–Tokat
Faculty of Veterinary Science–Elazig
Soil and Water Research Institute–Tokat

IX. Central-south Anatolia
Faculty of Agriculture–Konya
Faculty of Veterinary Science–Konya
Viticultural Research Station–Nevsehir
Soil and Water Research Station–Konya

International Handbook of Universities (1989), MAFRA (1987b)